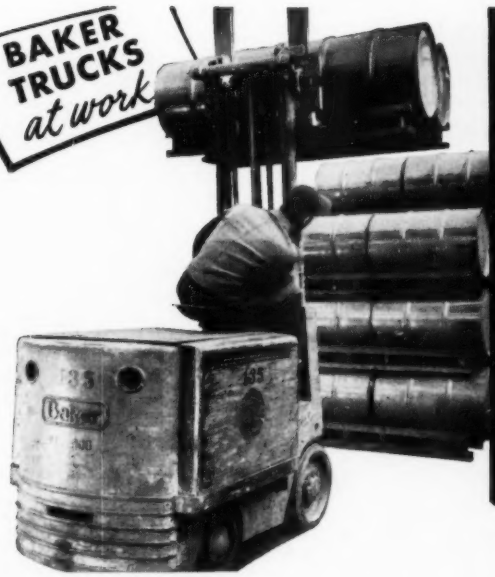
BAKER TRUCKS *at work*



Westinghouse saves in excess of $57,000 per year by FORK TRUCK HANDLING

● A fleet of fork trucks including Bakers, coupled with intelligent planning and material handling engineering, enables Westinghouse Electric Corporation to cut handling costs more than $57,000.00 per year at its huge East Pittsburgh works. Savings in which the Baker Trucks participate, include:

- **$12,000.00 warehousing raw materials in the molded materials section**
- **Another $12,000.00 handling finished molded products**
- **$9,000.00 on one scrap handling operation**
- **$7,500 by handling castings on pallets in yard storage**
- **100% added storage capacity in molded materials warehouse**
- **Doubling capacity of drum storage space in yard**

These savings were made possible by replacing manual handling and other slow methods with efficient fork-truck unit-load handling. In some instances Westinghouse devised special pallets and containers to achieve greatest speed and efficiency from their versatile Fork Trucks.

Illustrated above is a special stringer pallet which enables Baker Fork Trucks to tier and transport drums four at a time, doubling storage capacity and speeding these operations substantially by eliminating manual methods.

This method of handling scrap saved $9,000.00 in one year. Driver merely operates controls—the truck does the work.

Handling castings in yard storage on pallets with Fork Trucks saves $7500.00 per year over former methods—and multiplies storage capacity by tiering.

By palletizing bagged materials for fork truck handling, tiering to warehouse ceiling more than doubles storage capacity. This method cuts handling costs $12,000.00 per year.

THE BAKER-RAULANG CO. 1853 100th anniversary 1953 THE BAKER-RAULANG CO.

Write for your copy of the "Baker Handling Library" a new portfolio of actual case histories.

THE BAKER-RAULANG COMPANY
1251 WEST 80th STREET • CLEVELAND 2, OHIO

The Baker-Lull Corporation, Subsidiary, Minneapolis, Minnesota
Material Handling and Construction Equipment

Baker
industrial trucks

For more facts circle 502 on Reply Card

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Industrial Engineering Conference

THE FIFTH ANNUAL Industrial Engineering Conference will be held in the Student Union Building on the campus of Michigan State College, East Lansing, Michigan, from September 14 to 18.

"Industrial Engineering—the Key to Effective Management," is the theme of the 1953 Conference. The program is planned around six workshop groups and a series of five general sessions.

Because the Conference is limited to one week, each workshop group will meet every day. The entire conference will meet together for a general meeting each afternoon.

Workshop groups will be held in: Beginning Motion and Time Study, Advanced Motion and Time Study, Plant Layout and Materials Handling, Production Control, Industrial Engineering for Small Plants and Statistical Quality Control.

Conference registration fee is $50. Questions regarding specific details of the Conference should be directed to: Professor James M. Apple, Mechanical Engineering Department, Michigan State College, East Lansing, Michigan.

New Officers for San Francisco Society

ON JUNE 11, the Plant Engineers Society of San Francisco held its annual election of officers. The following plant engineers were selected for 1953-1954: **Fred M. Reibin,** General Metals Corp., Enterprise Div., president; **W. H. Graham, Jr.,** of Simons Co., vice president; **Bernard C. Flett,** of Bethlehem Pacific Coast Steel Corp., treasurer; **Edward J. Hinde,** of Cutter Laboratories, will serve as Member-at-Large; and **L. J. Ghilardi,** of Hall-Scott Motor Div., will serve as Alternate Member-at-Large.

The duties of secretary are temporarily being handled by **A. A. Caridis,** of Heat and Control, Inc.

New Plants Going Up

Vapor Heating Corp. is building a new plant in Niles, Illinois . . . A new addition to the Crawford Avenue plant of **ILG Electric Ventilating Co.,** Chicago, Illinois, is being constructed . . . Plant facilities of **Timken Roller Bearing Co.** are being expanded at Bucyrus, Ohio, with the construction of three new single-story buildings . . . **Koppers Co., Inc.** recently dedicated the first unit of the Williams Petrochemical Plant at Port Arthur, Texas . . . **John Hassall, Inc.** is constructing a new plant in Westbury, Long Island . . . A new plant for manufacturing television picture tubes is being built for **Pioneer Electronics Corp.** at Santa Monica, California . . . **E. F. Houghton & Co.** will manufacture synthetic rubber packings at its new plant in Hopkins, Minnesota . . . **Lindberg Steel Treating Co.** is constructing a new plant in Melrose Park, Illinois, which will double the company's heat treating capacity . . . **Crouse-Hinds Co.** is in the final phase of its building expansion program that started in 1946. The last step will be the construction of a new aluminum foundry expected to be completed in the fall.

How to Expand Jobs and Production

ANSWERS TO THE questions: Can we maintain a prosperous dynamic economy? As the defense program levels out or begins to decline, will jobs, markets and production decrease? And, are there enough unsatisfied demands to maintain an expanding economy? will be found in the booklet, "A Program for Expanding Jobs and Production."

The booklet discusses such subjects as: our economic objective, incomes and spending, investment expenditures, monetary and credit policy, what business can do, and lists specific business policies.

Copies of this booklet may be obtained from Economic Research Department, Chamber of Commerce of the United States, Washington 6, D. C., at 50 cents for each copy.

Montreal Materials Handling Show

MONTREAL Materials Handling Show will be held concurrently with the Montreal Tool and Industrial Equipment Show at the Show Mart, Berri Square, Montreal, Quebec, from November 9 to 13.

By combining all types of materials handling equipment, tools and supplies, under one roof the Show should prove of interest to users of materials handling equipment and production men from coast to coast.

Plant engineers interested in attending this Show, should write to E. M. Wilcox, Ltd., Managers, Montreal Materials Handling Show, 19 Melinda St., Toronto, Ontario, Canada, for registration card.

Seminar on Adhesives

A COMPARISON seminar on organic bonding is scheduled for some time in October by the Eutectic Welding Alloys Corp. at its training institute in Flushing, New York. It will continue for four days and is open to all who wish to investigate the adhesive bonding of materials.

Experts in various fields of bonding will compare notes. A metallurgical engineer will explain what can and cannot be done with metals. A man who has grown up with the plastic industry will discuss synthetic resins. Well known de-

(Continued on page 6)

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

Notice the CONCAVE SIDES (U.S. PATENT NO. 1813698) of the Gates V-Belt-

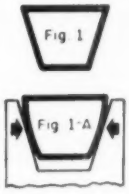
. . . that's why Gates V-Belts Last Longer!

Look at this!

In *half a minute* you can prove for yourself the belt-saving advantage of the CONCAVE SIDES.

Take any *straight-sided* V-Belt (Fig. 1) and bend it as it bends in going around its pulley. At the same time, grip its sides with your fingers and *feel* those sides *bulge out* as in Fig. 1-A.

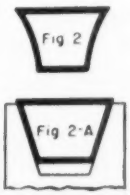
Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes extra wear at the points shown by the arrows (Fig 1-A).

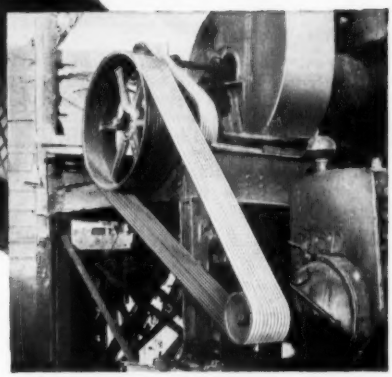


Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

As the belt bends, grip its sides—and you will feel the precisely engineered CONCAVE SIDES *fill out* to an *exact fit* in the sheave groove (Fig. 2-A).

These sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the full width of the Gates Vulco Rope—and this means *longer* belt life and *lower* belt costs for you!





Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES— The Gates Vulco Rope.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

CS-537

V-Belts — Hose Molded Rubber Goods for industry World's Largest Maker of V-Belts

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

For more facts circle 503 on Reply Card

Large or small jobs—
PANGBORN BLAST CLEANING
cuts maintenance cost and time!

Pangborn Blast Cleaning Machine—Cleans tanks, bridges, buildings, and other structures quickly and economically. Ideal for maintenance and other jobs, such as removal of dirt, scale, rust, etc. preparatory to painting. Six sizes, stationary or portable, from . . . **$187** and up..

Pangborn Blast Cabinet—Saves time and money in cleaning small metal parts . . . removing rust, scale, grime, old paint, etc. Produces smooth, clean surfaces on pieces up to 60" x 35" in size. Models from . . . **$319** and up.

Pangborn Unit Dust Collectors—Trap dust at the source. Minimize maintenance, allow reclamation of valuable material . . . **$286** and up.

Pangborn Hydro-Finish Cabinets—Remove directional grinding lines, hold tolerances to .0001". Reduce further finishing of tools, molds, dies . . . **$1410** and up.

Write for details on these machines to: PANGBORN CORPORATION, 3200 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

Pangborn
BLAST CLEANS CHEAPER
with the right equipment for every job

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'ROUND ABOUT

sign engineers will state their experiences and explain how a simple change in design can increase productive capacity and take advantage of modern bonding materials. Production men will report upon curing cycles and how production schedules—by the method adopted—can be improved or complicated.

In addition to talks by the experts, there will be practical laboratory demonstrations of the various bonding agents and a discussion of the possibilities of each.

There is no charge for the seminar, but those attending will be expected to pay their own transportation and accommodation charges. Requests for further information should be made to Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, New York.

Industrial Hydraulics Conference

ILLINOIS INSTITUTE of Technology will be host to the ninth National Conference on Industrial Hydraulics to be held on October 8 and 9 at the Hotel Sheraton, Chicago, Illinois.

Conference director will be O. T. Teichmann, assistant chairman of the heat-power department at Armour Research Foundation of Illinois Tech. Persons interested in attending this conference should contact Mr. Teichmann at Armour Research Foundation, Illinois Institute of Technology, 35 West 33rd St., Chicago 16, Illinois.

Personnel Changes

John Pappas and **David T. Rayner, Jr.**, after recently completing a training course for graduate engineers, have been assigned to the plant engineering department of Allis-Chalmers Mfg. Co.

K. F. Houseman was recently appointed manager of manufacturing of General Electric Company's new home heating and cooling plant in Trenton, New Jersey. Prior to his new appointment, he was manager of Plant and Division Services at the company's jet engine plant in Evendale, Ohio.

People to Travel by Conveyor

TESTS CONDUCTED with a 9-ft wide, 60-ft long passenger conveyor belt, synchronized with 14-place passenger cars, have proved the feasibility of conveyor belt human transit systems.

Design and belting engineers for Goodyear Tire and Rubber Co. and Stephens-Adamson Mfg. Co. have just completed exhaustive tests with men, women and children of all ages, including the physically handicapped, on an actual passenger conveyor belt located in the Stephens-Adamson's plant in Aurora, Illinois.

With a 9-ft wide belt, 16,000 people an hour can be moved with no stopping, waiting or batching. Utilizing passenger cars on an adjacent belt moving at the same speed, with an accelerating system to 15 mph, the same number of persons can be handled over a longer distance.

The passenger conveyor belt was primarily designed to replace the subway shuttle system between Grand Central and Times Square in New York City.

Refrigeration and Air Conditioning Exposition

DEMONSTRATIONS of the growing uses of refrigeration and air conditioning as a means of increasing industrial production, reducing costs and improving quality will be the highlight of the eighth Refrigeration and Air Conditioning Exposition. The Exposition, held every two years, will take place on November 9 to 12 at the Public Auditorium, Cleveland.

Additional information and registration blanks may be obtained by writing to Banner and Grief, 250 West 57th St., New York 19, N. Y.

Self-Study Course in Welding

A SELF-STUDY COURSE, containing previously unpublished information on Lincoln Electric Company's WelDesign System, is now available to industry. This material was developed for a nation-wide in-plant training program to create low cost, machine designs in steel.

This manual provides complete data, charts, nomographs, table of equivalents, cost calculators, moment of inertia rule, process selection charts, process time charts, shaping suggestions, check points and other guides.

In addition to the manual, other aids for self-study are provided. A guide to the use of the manual for self-study gives instruction in the use of the charts, calculators and other data. A copy of the *Procedure Handbook of Arc Welding Design and Practice* is also included.

One set of weld standards for use in applying the WelDesign System completes the self-study kit. This set of standards is printed on onion skin to permit duplication so that all departments of a manufacturing organization will use the same weld standards.

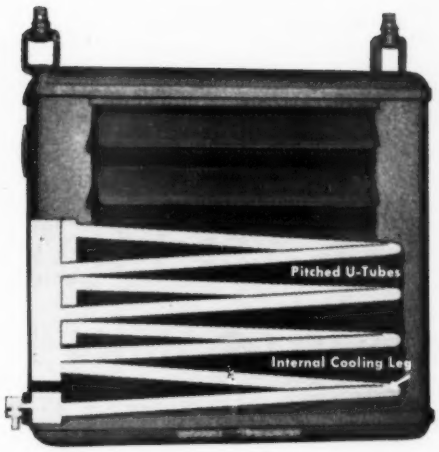
Each set of material for self-study is available for $10 from the Lincoln Electric Co., Cleveland 17, Ohio.

Conference on Lighting

PAPERS COVERING a wide range of interests will be presented before the technical sessions of the Illuminating Engineering Society Conference, September 14 to 17, at the Hotel Commodore, New York.

The program will discuss the following phases of lighting over the four day period: Light and vision, light sources and controls, lighting evaluation, utilization, street lighting, measurements, and daylighting.

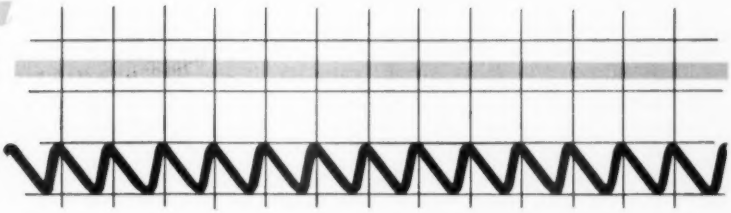
Registration information may be obtained by writing to Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.



when buying unit heaters

be sure you get this

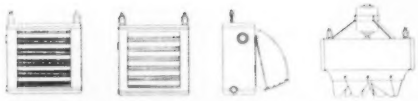
...not this!



With **THERMOLIER...**

the Grinnell Unit Heater . . . you get

CONTINUOUS RATED CAPACITY



THERMOLIER FEATURES

INTERNAL COOLING LEG A Grinnell feature which permits the use of a plain thermostatic trap for draining condensate.

PITCHED U-TUBES Built-in pitch of U-tubes provides complete drainage of condensate and elimination of destructive water hammer.

CONTINUOUS RATED CAPACITY The combination of Thermolier's internal cooling leg and the built-in pitch of tubes assures continuous rated capacity.

BUILT-IN EXPANSION PROVISIONS Every tube is an expansion bend of the U type to allow for independent expansion and contraction of each tube.

TUBE-TO-HEADER CONSTRUCTION Safety and durability assured by unique tube-to-header construction.

EASE OF ERECTION Exclusive with Thermolier are the adjustable swivel couplings which provide an easy, cost-saving method of hanging the unit.

SIMPLE PIPE CONNECTIONS The supply and return piping connections are on the same side to assure compactness, neatness and economy in installation.

MOTORS Thermolier motors are built specifically for unit heater duty. They give maximum operating efficiency with minimum power cost.

The practical advantages of unit heating, of course, are well known. But in order to get *maximum* economy and efficiency, certain engineering and structural features *must be* present in the unit heater of your choice.

Take provisions for draining off condensate. Failure to provide freedom from collected condensate in the heating element can interfere with heat output and adversely affect capacity.

A Thermolier Unit Heater successfully handles this drainage problem with its pitched U-tubes and internal cooling leg, through which all the condensate passes. In fact, condensate cooling is so efficient with Grinnell Thermoliers that a thermostatic trap — the simplest and least expensive of all traps — can be used with every model. Condensate temperature is lowered to the point where the trap is always draining — giving Thermolier Unit Heaters their *continuous rated capacity*.

Check Thermolier's advantages at left. For more details, call your local Grinnell distributor — or send for catalog.

GRINNELL

THERMOLIER UNIT HEATERS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

For more facts circle 505 on Reply Card

NEW...AB-I Circuit Breakers give you greater capacities in smaller enclosures

Here's news for circuit protection value seekers. The new E and J frame breakers give you all the proved protection of Westinghouse AB-I Circuit Breakers *plus* more circuit capacity in smaller enclosures than ever before available.

New 225 amp J Breaker is ⅓ smaller. More compact than any other 225 amp breaker, the new Westinghouse J Breaker is incorporated in attractive enclosures that are ⅓ shorter. It is available in all NEMA types. This new breaker has thermal adjustable magnetic trip.

100 amp E Breaker doubles former capacity. The new Westinghouse E Breaker has been doubled in rating—with no increase in breaker frame size! It's equipped with thermal magnetic trip—trip ratings are noninterchangeable, nonadjustable. Smart, new enclosures reflect the E's unusual compactness.

Your best protection buy is AB-I. Like all Westinghouse AB-I's, the new E and J Breakers give you top value in circuit protection. There are no fuses to replace. There is no maintenance. Production is never shut down needlessly. AB-I's trip only on short circuits or destructive overloads. They do *not* trip on temporary, harmless overloads. And when power is cut off, it's restored fast—by the operator!

Look ahead. Over the years, rugged, reliable AB-I Circuit Breakers cost less than any other type of circuit protection—often save far more than they cost originally.

Get the full story. See your Westinghouse Distributor, or write for B-5456, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30136

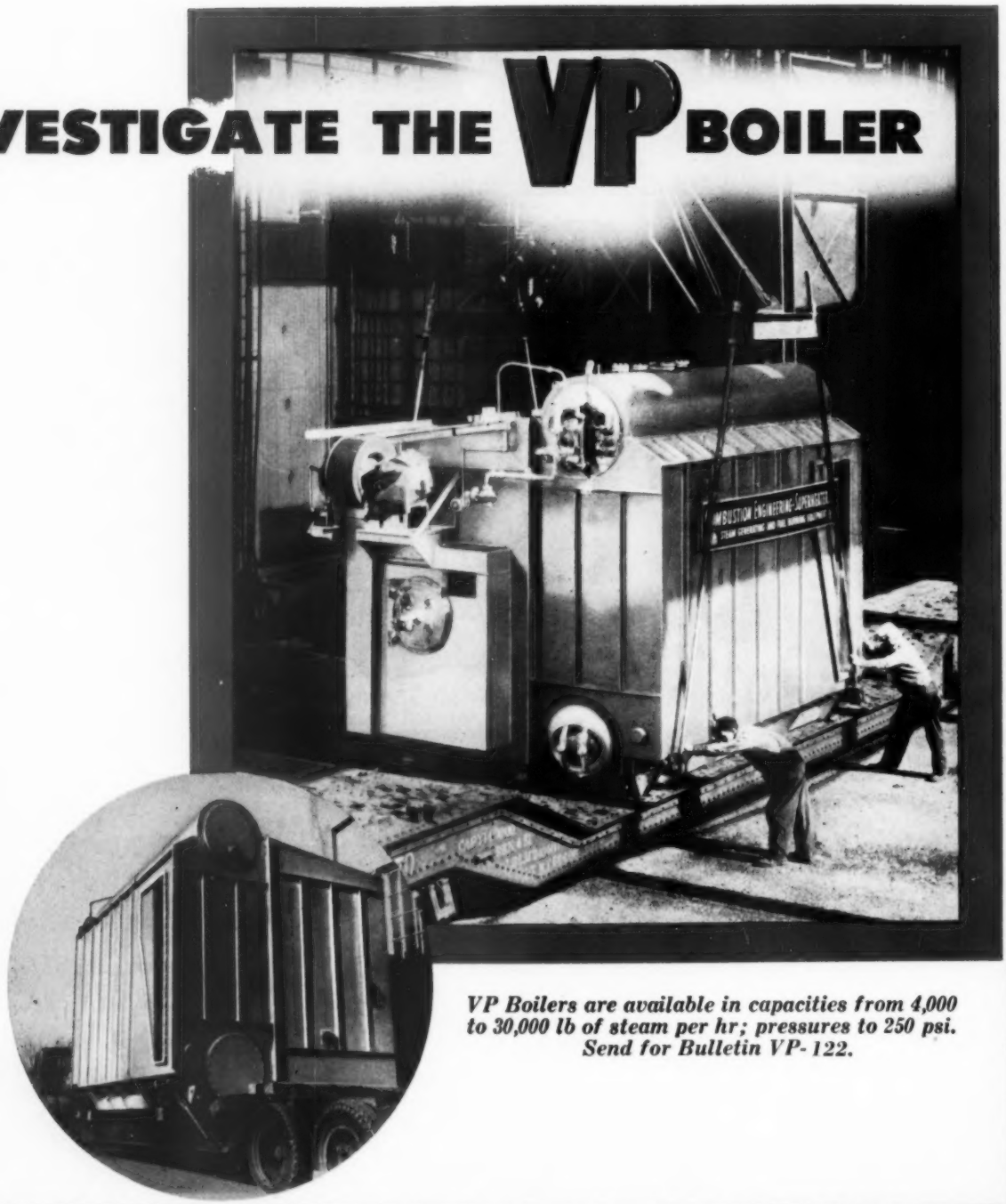
YOU CAN BE SURE...IF IT'S

Westinghouse

NEW 225 AMP
J BREAKER
NEW 100 AMP
E BREAKER
LINE
ON
WESTINGHOUSE

Don't settle for just

INVESTIGATE THE VP BOILER



VP Boilers are available in capacities from 4,000 to 30,000 lb of steam per hr; pressures to 250 psi. Send for Bulletin VP-122.

COMBUSTION

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

A Package Boiler

...the Package Boiler with EXTRA features

If you're in the market for a Package Boiler, here's the problem you face. There are a number of water-tube, package boilers being offered today. Most of them look pretty much alike. And, in some respects, they *are* alike.

But you're looking for the "best buy" in a package boiler. Therefore your interest lies in points of difference rather than points of similarity. The C-E Package Boiler, Type VP, offers all the better design features of its contemporaries *plus* the following extra features:

1. **Fully Water Cooled Furnace** — More cooling area per cubic foot of furnace volume than any other boiler of the VP's size and type. In all but the three smallest sizes, the VP Boiler has water-cooled walls on *all six sides* of the furnace — including the burner wall.

2. **Larger Lower Drum** — The 30-in. diameter lower drum permits a simple, symmetrical tube arrangement . . . provides easy access for washing down or inspection . . . its greater water storage capacity facilitates the handling of fluctuating loads.

3. **Centrifugal Fan** — This more efficient type of fan operates at lower speed than other types and is quiet in operation. In fact, its average noise level is less than half that of typical high-speed fans used on most package boilers.

4. **Simple Baffle Arrangement** — Minimum changes in direction of gas flow — no baffle at all in convection bank of larger VP Boilers. This means lower draft loss . . . simplified soot blowing . . . absence of dead pockets, thus, maximum heat pick-up. In the intermediate sizes, a water-cooled baffle assures minimum maintenance.

B-673

ENGINEERING Inc.

C-E

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

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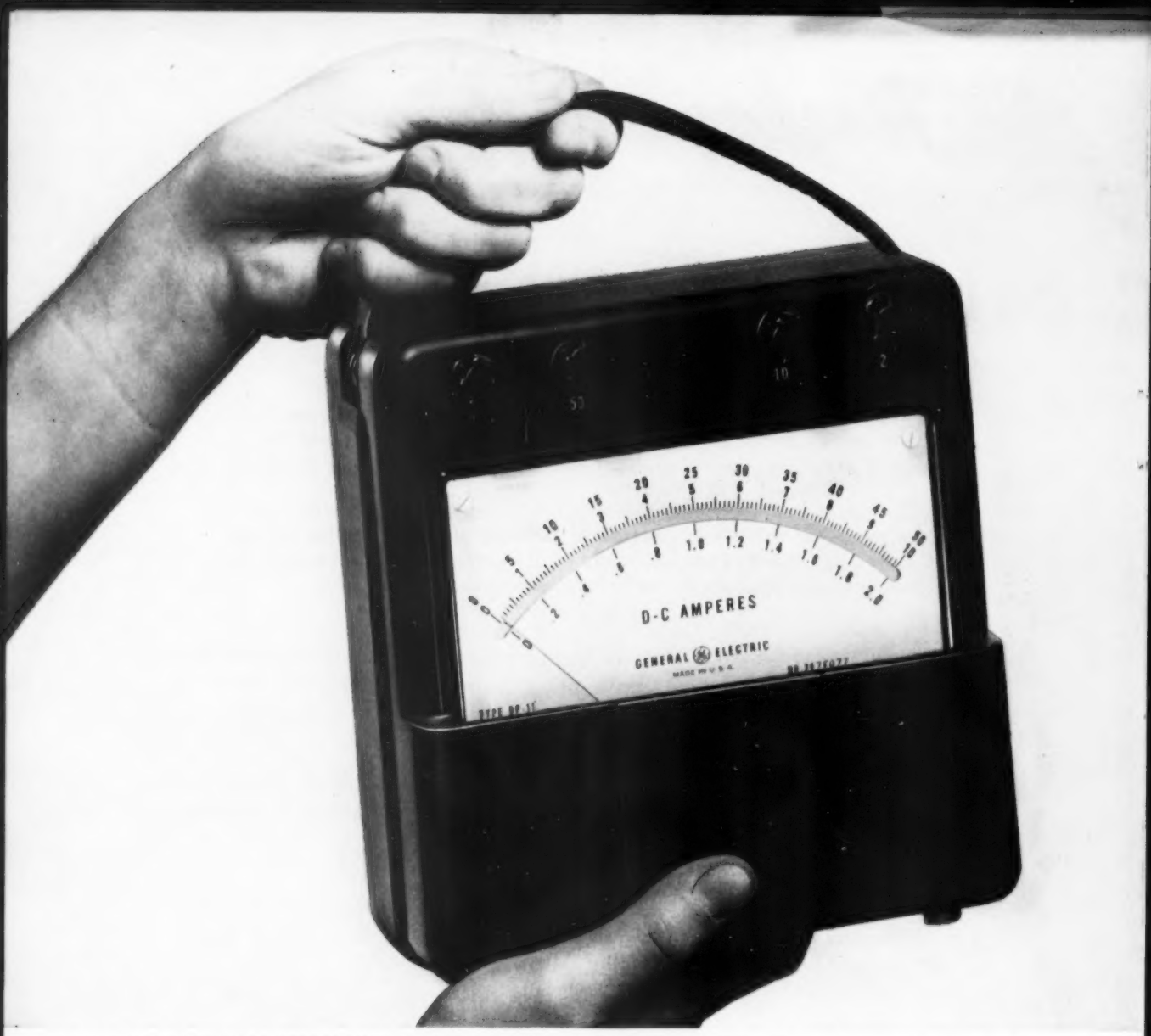


5½-INCH SCALE AND SHADOW PROOF DIAL GIVE THIS NEW D-C INSTRUMENT HIGH READABILITY—FOR FAST, CORRECT MAINTENANCE CHECKS

G.E. Announces New Portable Instrument

General Electric's new line of DP-11 portable indicating instruments has been designed with the practical measurement problems of the electrical maintenance man in mind. Readability, capacity to withstand rough treatment, and dependability—these working qualities are inherent in the product features described below.

Twin to the DP-11 line is the new DP-12 instrument group. The DP-12 offers a more refined instrument for applications where higher accuracy is desired—laboratory testing, and high-accuracy field work. In addition to this greater accuracy the DP-12 has all the improved features of the DP-11.

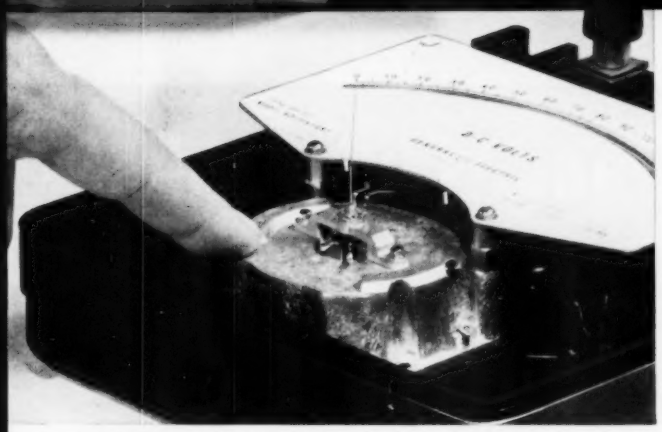
IMPROVED READABILITY

The dial of the DP-11 indicator is a long, readable 5½ inches. By making readings easier, this feature cuts down errors, speeds maintenance schedules.

Readability is further increased by the molded plastic window, which permits flooding the entire scale with light from the front and three sides.

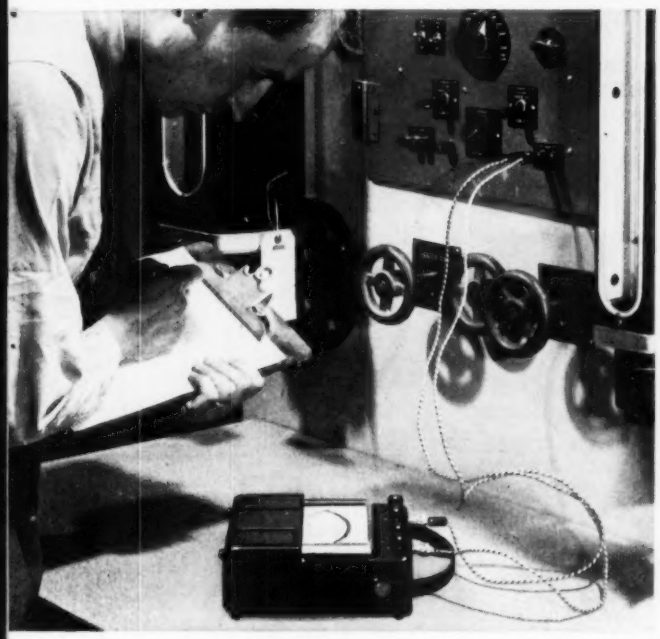
STURDY DESIGN

A thick Textolite* case enables the DP-11 instrument to stand up against the rough handling unavoidably given portable instruments. Also, shocks and jars are absorbed internally by spring-mounted jewel bearings.

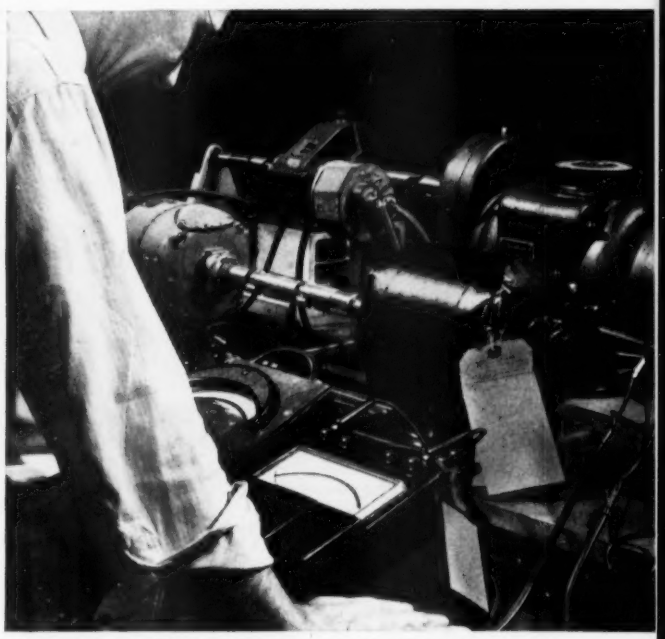


CONCENTRIC MAGNET SYSTEM is shielded against stray magnetic fields with a soft-steel ring. Self shielding helps to assure uniformly accurate readings. System provides maximum magnetic efficiency.

PROTECTIVE EXTRA-THICK CASE is molded of durable Textolite* for greater resistance to breakage. Rounded corners also contribute to strengthening the case.



EASY-TO-READ DP-11 INSTRUMENT helps to speed checking of critical testing facilities required for producing jet aircraft mass flow-meters. Scale clarity reduces possibility of error.



HIGH-ACCURACY DP-12 PORTABLE INSTRUMENT (indicator at right) is used in conjunction with tachometer generator sets to calibrate rpm indicators for switchboards.

Featuring Improved Readability, Sturdiness

This all-round durable construction means the General Electric DP-11, -12 instruments will give you repeatedly good performance with a minimum of maintenance and out-time.

MANY TYPES AVAILABLE

Both the DP-11 and DP-12 portables are available in several ranges as ammeters, voltmeters, millivoltmeters, milliammeters, and microammeters. The DP-11 is accurate within $\pm \frac{1}{2}$ of 1% of full scale and the DP-12—within $\pm \frac{1}{4}$ of 1% of full scale value.

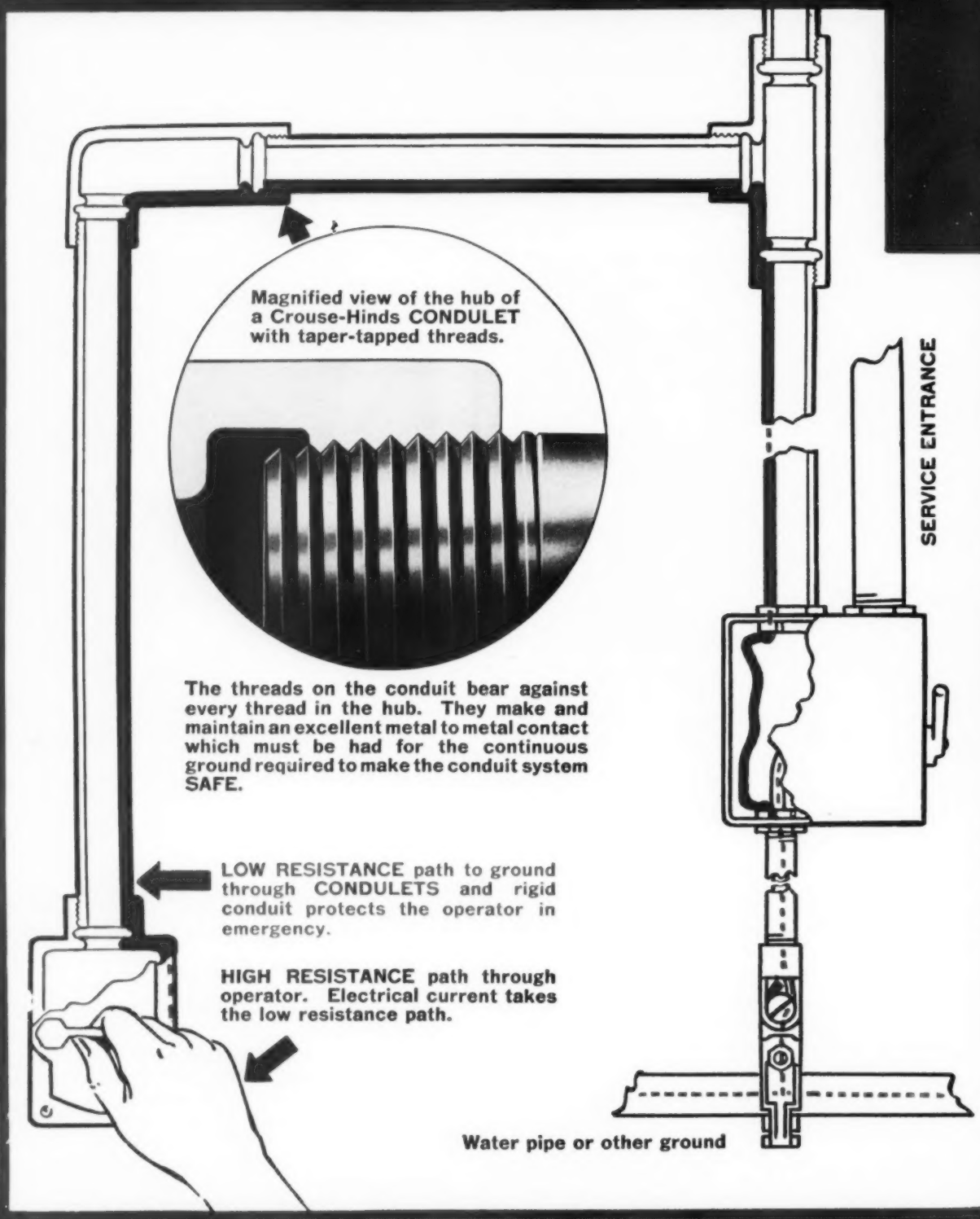
MORE INFORMATION

For further details on how the DP-11, -12 instruments can help you to speedier, surer measurements, contact your G-E Apparatus Sales representative, or write for bulletin GEC-979 to Section 602-254, General Electric, Schenectady 5, New York.

*Reg. trademark of General Electric Company

GENERAL ELECTRIC

CONDULETS* and rigid conduit


Magnified view of the hub of a Crouse-Hinds CONDULET with taper-tapped threads.
The threads on the conduit bear against every thread in the hub. They make and maintain an excellent metal to metal contact which must be had for the continuous ground required to make the conduit system SAFE.
LOW RESISTANCE path to ground through CONDULETS and rigid conduit protects the operator in emergency.
HIGH RESISTANCE path through operator. Electrical current takes the low resistance path.
SERVICE ENTRANCE
Water pipe or other ground

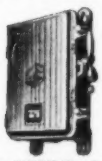
... the wiring method that gives you maximum SAFETY for workers AND property

Typical CONDULETS

Type T Obround Conduiet

Type LR Obround Conduiet

Type FS Conduiet

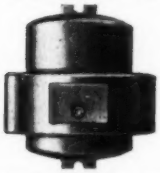


Type WMK Enclosed Safety Switch Conduiet

Type VC Vaportight Industrial Lighting Fixture

Type EVA Explosion-Proof Industrial Lighting Fixture

Type GUAC Explosion-Proof Junction Conduiet



Type EPC Explosion-Proof Line Starter

A low resistance grounding circuit is of vital importance in any electrical system. The combination of rigid conduit and CONDULETS provides the safest installation because this combination assures the permanence of the grounding circuit. In any grounding path, every joint that isn't tight in the beginning or loosens from vibration makes a high resistance point. Such high resistance creates a hazard for workers and can cause disastrous fires.

All rigid conduit has tapered threads and all CONDULETS (made only by Crouse-Hinds) have taper threaded hubs. This combination makes a secure joint that is tight in the beginning and stays tight. These joints will not loosen from vibration and assure a reliable and permanent low resistance path to ground. This SAFETY feature provides maximum protection against personal injury and fire.

Besides safety, a CONDULET installation gives you these additional definite advantages:

- **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.
- **FLEXIBILITY.** To meet all the diverse requirements of modern electrical layouts, CONDULETS are made in a wide variety of shapes and sizes with varied hub arrangements, including a full line of CONDULETS with detachable hub plates.
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

* *CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee Minneapolis—New York—Philadelphia—Pittsburgh—Portland, Ore.—San Francisco Seattle—St. Louis—Washington. RESIDENT REPRESENTATIVES: Albany Atlanta—Baltimore—Charlotte—New Orleans—Richmond, Va. Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

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To set up an inspection station anywhere in your plant is a simple operation with HALLOWELL Shop Equipment. All you have to do is design it as you want it and order standard, ready-made units from your HALLOWELL distributor. Write for complete details. STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

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Investigate...find out how proper training can mean more handling jobs done faster, at less cost...find out how to reduce costly, time-consuming accidents to men and machinery...how to realize substantial savings in maintenance costs and increased Truck life. Just mail the coupon today.

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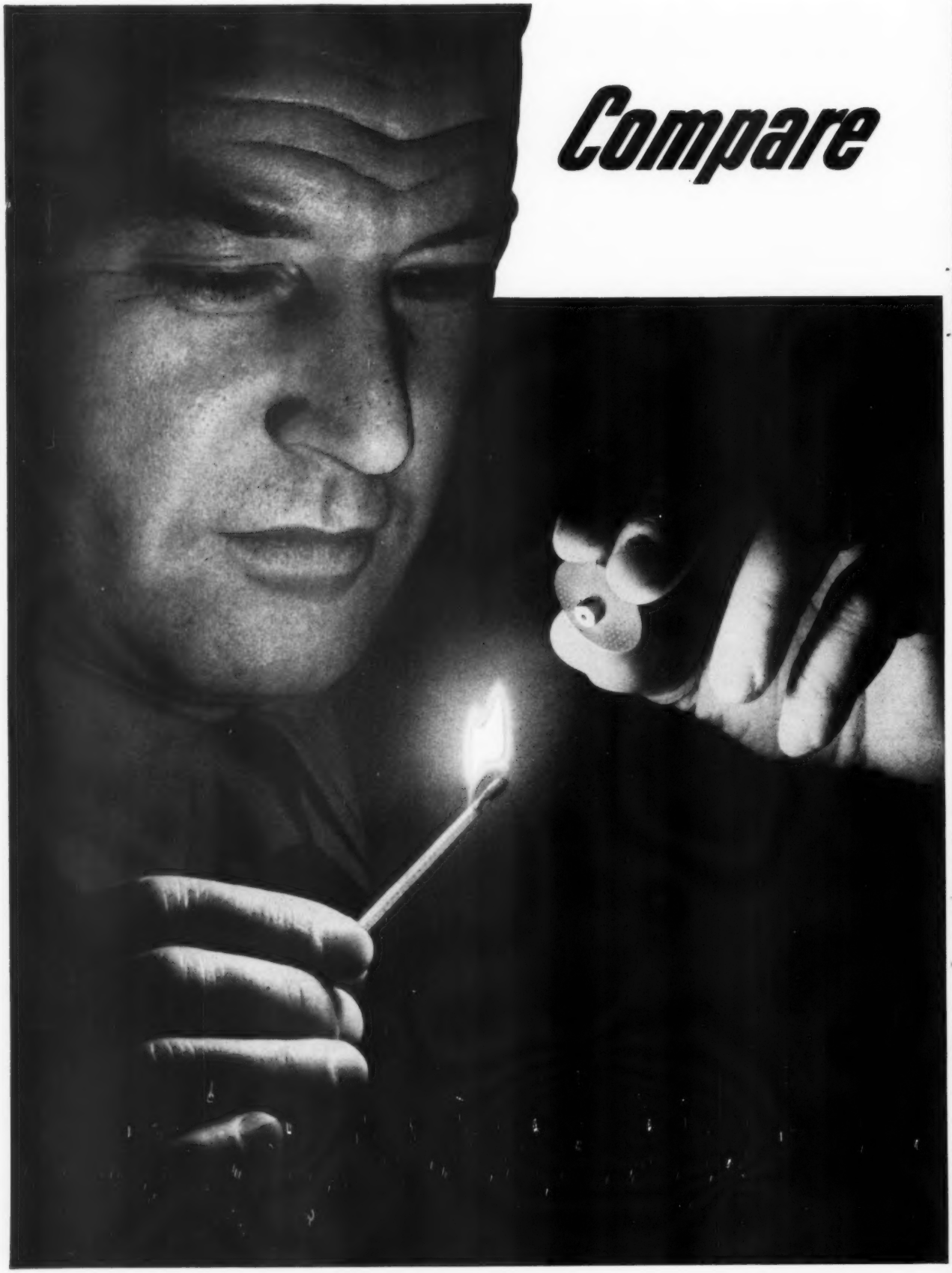

Compare

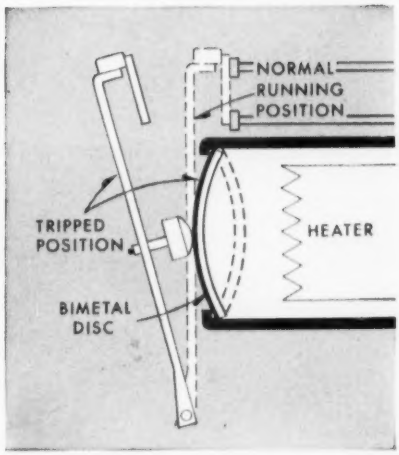
Life-Line starters by this simple demonstration

Proof that Life-Line Starters give you instant, positive motor protection

See this flame test. When heated and placed upon a flat surface, this bi-metal disc will snap up into the air. Here is simple action—demonstrated right before your eyes—powerful, positive action to protect your motors from the destroying heat of dangerous overload.

The bi-metal disc is the nerve center of the overload relay designed into every Westinghouse Life-Line Starter. The disc accurately stands watch over the build-up of motor heat, because a motor can become overloaded. At precisely the right instant, just before a motor may be dangerously overloaded, the disc snaps, as in the flame test. This causes starter contacts to open lightning fast, protecting your valuable motor.

Only Westinghouse Life-Line Starters have the bimetallic, snap-action, disc-type overload relay . . . the most precise motor protective device you can buy. But, just as important, the bi-metal maintains its precision calibration for the life of the starter. It will not fail because it cannot fatigue, age or oxidize. Premature, or "hot" resets can ruin other types of overload relays, such as the solder- pot. Remember—the price of poor protection is smoldering, useless motors, costly motor rewind jobs, other damaged equipment, down time and expensive production pile-ups.



Westinghouse bi-metal principle of overload relay protection, dependable for the full life of the installation.

Proof that Life-Line Starters are tough, maintenance free

Simplicity of design, fewer and more rugged components, only one moving element . . . all spell toughness and long life in Westinghouse Life-Line Starters. Parts that aren't there, can't wear.

Call your Westinghouse Representative to see the flame test. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30146

YOU CAN BE SURE... IF IT'S **Westinghouse**

For more facts circle 512 on Reply Card

DRAMATIC SMOKE TESTS PROVE . . .

you can produce unlimited heating patterns with a single Trane Projection Heater

1 Smoke tests show how you can throw heat down to worker level in a concentrated stream. The patented Louver Cone Diffuser makes the difference.

With the diffuser you can mount this TRANE Projection Heater as much as 60% higher in craneways, aisles and bays. It reclaims waste ceiling heat . . . pinpoints warmth on work areas far below.

2 To spread a gentle flow of heat over a wide area, simply close the Louver Cone blades. The TRANE Projection Heater then turns the heat outward from the top of the Louver Cone.

3 Without a diffuser, heat is forced down with a swirling motion . . . diffuses rapidly. This powerful standard unit becomes far more versatile when you add the Louver Cone Diffuser.

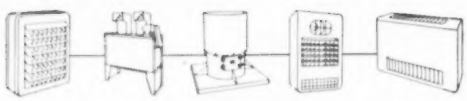
4 To flood an assembly line or general production area with a constant flow of warm air, adjust the individual Louver Cone blades at angles to deflect the heat to match the area below.

5 To warm two areas at once, you can adjust the Louver Cone blades to pinpoint part of the heated air straight down, yet diffuse the remainder outward in any direction you wish.

Laboratory smoke tests show graphically the versatility of TRANE Projection Heaters. With simple fingertip adjustments you can set the exclusive Louver Cone Diffuser to warm dozens of hard-to-heat factory areas in winter . . . provide better air circulation in summer. For complete information, write for free bulletin DS-327B.

Spot heat where you need it with . . .

TRANE Unit Heaters

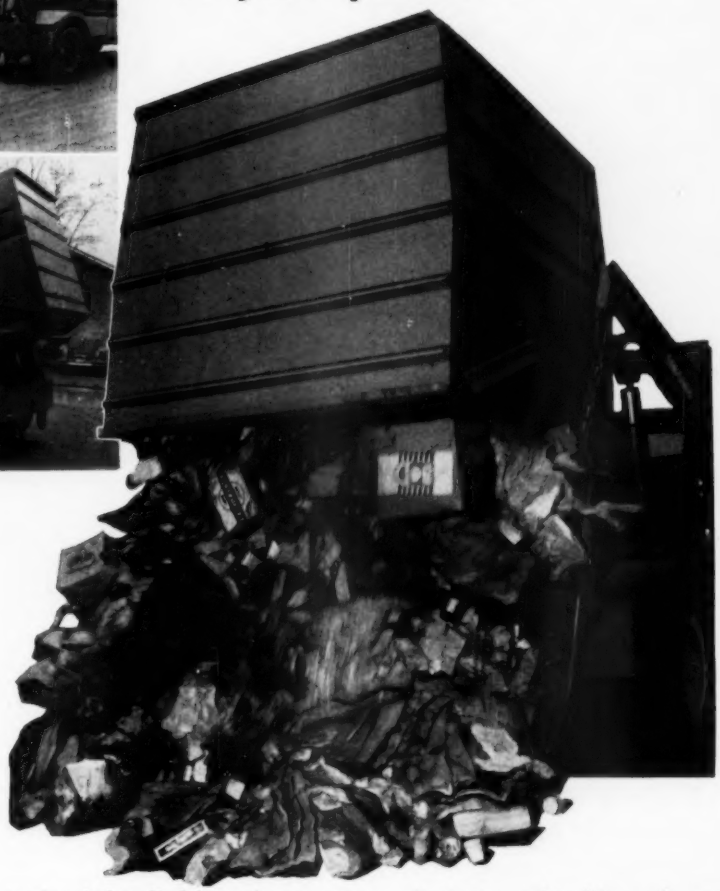


Model H Unit Heater | Torridor | Ventilating Heater | Gas-Fired Unit Heater | Force-Flo Heater

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton Penn.
Trane Co. of Canada, Ltd., Toronto • 87 U.S. and 14 Canadian Offices

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

Rubbish Disposal is only ONE of the Cost Cutting jobs for the Dempster-Dumpster in your plant...



It's amazing, almost to the point of fantasy, yet so soundly real, what the minds of men in all types of industry have cooked up for more efficiency and reduced costs with the Dempster-Dumpster.

Hundreds of plants are handling materials of practically every description with one truck-mounted Dempster-Dumpster serving scores of detachable containers. Here are just a few. Oils, gases, and liquids handled in our Tank Type Containers . . . tools and equipment in our Tool Shed Type Container . . . containers on casters placed for receiving steel chips from lathes or at conveyors for receiving finished products . . . container with doors and windows, replacing shacks for plant guards or nightwatchmen . . . containers built to handle chlorinator ash residue of approximately 1500° F. and there are dozens more.

Containers are placed wherever material accumulates. When loaded each is picked-up, hauled and emptied (as illustrated above) . . . or load set down intact. The entire operation is handled by only one man, the driver, by hydraulic controls in cab.

The containers are built in capacities up to 12 cu. yds. and each is designed to suit the materials to be handled—be they bulky, light or heavy . . . solids, liquids or dust.

One Dempster-Dumpster, with driver, does the work of 3 to 5 conventional trucks . . . eliminates trucks and crews standing idle . . . eliminates rehandling of materials and increases efficiency and good plantkeeping.

If you have even any remote idea that this equipment could be adapted to your operation, by all means contact us because being without the Dempster-Dumpster System could easily be costing your company thousands of dollars annually. Manufactured and sold exclusively by Dempster Brothers, Inc.

One Dempster-Dumpster Handles All Containers . . . . All Sizes . . . . All Designs

DEMPSTER BROTHERS, 183 SHEA BLDG., KNOXVILLE 17, TENNESSEE

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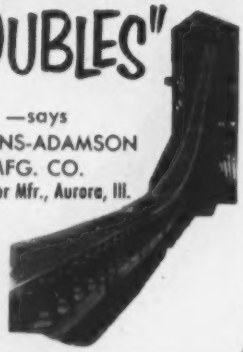
"NO MORE LUBRICATION TROUBLES"

—says STEPHENS-ADAMSON MFG. CO.
Conveyor Mfr., Aurora, Ill.



"LUBRIPLATE Lubricants satisfy the 'one-shot' requirements of our conveyor idlers. LUBRIPLATE effectively lubricates each bearing in turn and flows through the hollow shaft to the next bearing. We do not know of a single case of bearing trouble through faulty lubrication where LUBRIPLATE has been used."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

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BACKTALK about our past issues

Edited by R. L. Marinello

Plans Plant Educational Program

PLANT ENGINEERING:

"The Carnation Co. is contemplating instituting an educational program to train members of the engineering crew to become chief plant operating engineers and also improve the quality of the present chief plant operating engineers. Usually the people we will be dealing with will have had a high school education or its equivalent.

"Our program is still in the formative stage. However, at present it seems logical that we will have either to issue or to have issued informative literature and that it be handled somewhat similarly to a correspondence course.

"A typical plant will have a steam load of approximately 15,000 to 20,000 lb of steam per hour generated by water tube boilers, fired by pulverizers, stokers, or gas burners, depending on the location and availability of fuels. We normally generate our own electricity and use Uniflow engines and generators having a total capacity of around 400 kw. Our refrigeration plant will have a capacity of approximately 150 tons of ammonia refrigeration furnished principally by two cylinder vertical ammonia compressors.

"We would certainly appreciate any suggestions you can give us on how best to proceed with this educational program." *H. S. Christiansen, Engineering Department, Carnation Co., Los Angeles 36, California.*

Editor's Note: If any readers have had any experience with an educational program that would be of help to Mr. Christiansen, he would appreciate hearing from you. You may address your letter to him directly or send it to PLANT ENGINEERING to be forwarded.

Who Has Answer to Scum Problem?

PLANT ENGINEERING:

"Can you help us with the following problem: We do not have enough storage space for our finished castings, so some of them are doped and stored outside. Before sending them to the assembly department, this dope is steamed off with a soap solution.

"The building where this work is done is in a part of the city not served by sewers and the building drain runs to a large gravel pit. The scum from the dope and soap plugs the top layer of the gravel and stops up the drain. Is there any way we can get rid of this scum?" *J. Burnham, Maintenance Engineer, The Cooper-Bessemer Corp., Mount Vernon, Ohio.*

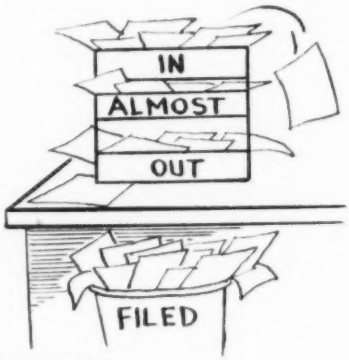
Washroom Brochures

PLANT ENGINEERING:

"Roberts Mann of the Cook County Forest Preserve District advises me you have washroom advisory brochures, prepared by authorities, available upon request.

"I would appreciate having these for reference in the preparation of a report on park sanitation for the American Institute of Park Executives. This work is being carried out in cooperation with the extension service of Michigan State University, with Professor Arthur T. Wilcox in charge." *Walter A. Tucker, Columbus Metropolitan Park District, Columbus, Ohio.*

Editor's Note: Your request has been forwarded to Mr. A. Q. Johnston, Administrative Assistant, Industrial Sales Division, Scott Paper Co., Chester, Pennsylvania, who will supply you with the brochures.



Comments on Package Boiler Article

PLANT ENGINEERING:

"The article 'Let the Job to Be Done Govern Packaged Boiler Specifications,' by Mr. R. E. Derby on page 94 of the March, 1953, issue is very interesting but appears to me to give a misleading comparison of the costs of what he calls the packaged boiler plant and the custom designed plant.

"The cost as given for the first is about $1.00 per pound of steam generated which is much lower than the usual price quoted on these units, f.o.b. plant siding. I have had quotations on a number of makes and sizes running from 150 hp to 350 hp within the last year and in no case has the f.o.b. price been as low as $1.00 per pound of steam generated based on manufacturer's rating. All of these prices were on fully automatic units designed to burn No. 6 oil and for 15 lb pressure.

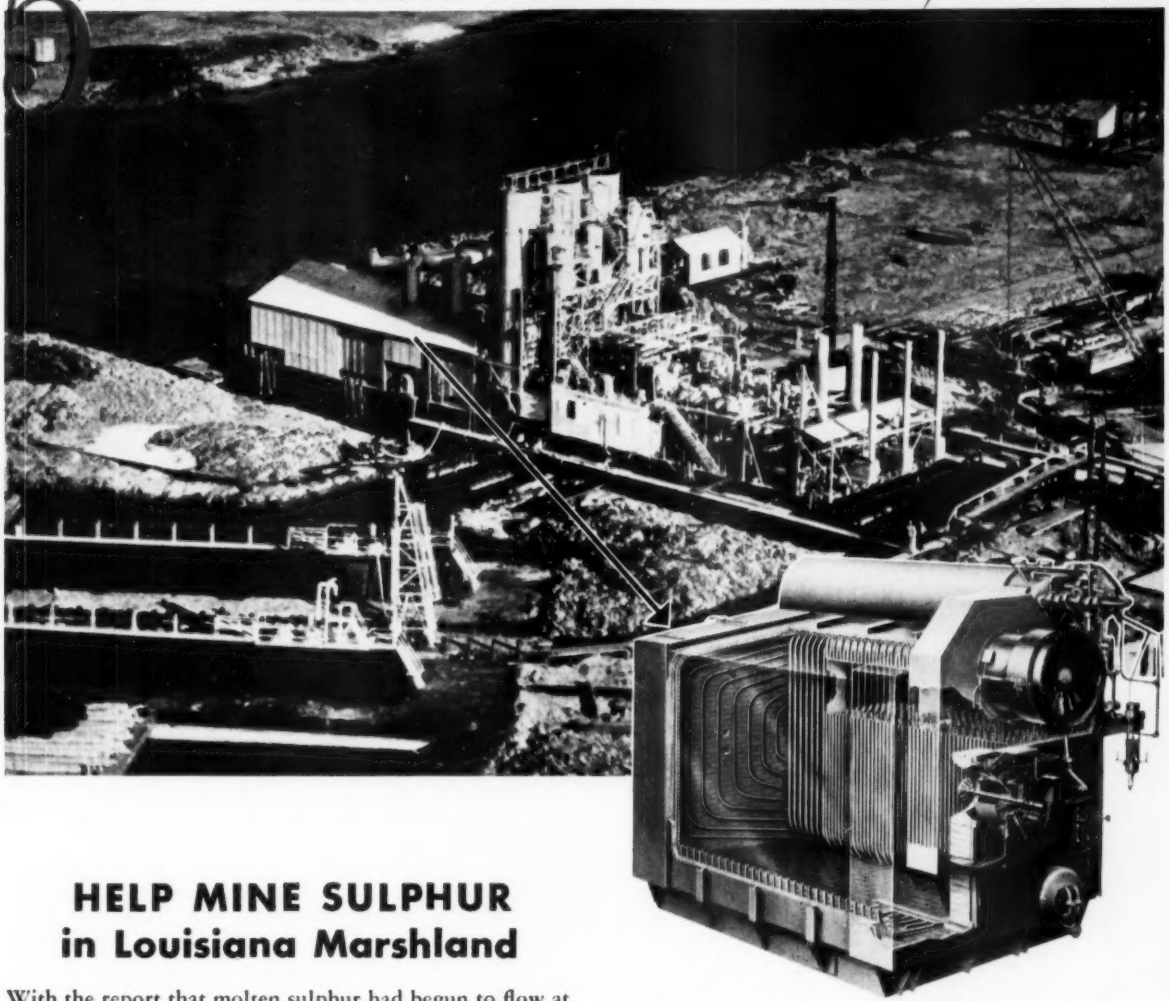
"As an actual comparison the boilers for two heating plants, each with a design load of 39,000 sq ft of equivalent direct radiation, were studied. To put the comparisons on the basis used by Mr. Derby, 4 sq ft of radiation is the equivalent of one pound of steam generated.

"In the first plant two boiler units were used and the installed costs based on actual quotations were: Packaged Boilers, $2.62; Scotch Type Heating Boilers, $2.72; Firebox Type Heating Boilers, $2.56. These prices included the installation of a 10,000 gal fuel oil tank and necessaty piping.

"In the second plant one unit was installed to replace an existing unit, the existing unit being retained as a spare. Here the relative prices were: Packaged Boiler, $1.56, and Scotch Type Heating Boiler, $1.37. This installation consisted of boiler, burner and minimum piping.

"The above comparisons are for heat-

5 B&W INTEGRAL-FURNACE BOILERS, TYPE FM



HELP MINE SULPHUR in Louisiana Marshland

With the report that molten sulphur had begun to flow at its new plant in the Louisiana marshland, The Freeport Sulphur Company announced the success of its unique sulphur mining development, climaxing eight years of intensive research. The only "amphibious plant" of its kind in the world, it is expected to produce about 100,000 tons of critically needed sulphur a year when in full production.

Playing a major role in the unusual operations are five B&W Integral-Furnace Boilers, Type FM. Each of the boilers can provide up to 30,000 lb steam per hr for turbine-driven blowers, turbine-electric generators, and to heat sea-water for the sulphur mining operation. The water is preheated by direct contact with the boiler flue gas passing through heat exchangers.

As part of a "plant" including shops, warehouses, and offices, and described as the "strangest craft since Noah's Ark", these B&W boiler units sit atop a 200-foot, specially-constructed steel barge towed to and resting on an oyster shell base laid on the bottom of Bay Ste. Elaine.

Cut-away view of typical B&W Integral-Furnace Boiler, Type FM, available in standard sizes for loads of 2900 to 28,000 lb per hr at steam pressures to 235 psi . . . also available for higher pressures.

They were chosen to assure efficient, economical performance under particularly arduous service conditions . . . are surrounded by a salt-water marsh and almost completely exposed to salt-water spray and other destructive actions of weather and climate.

Whether for sulphur mining or oil refining, for heat, process, or power requirements, versatile B&W Integral-Furnace Boilers, Type FM, are now in service or on order for more than 50 different industries and other users, with a total steam capacity exceeding 6½ million lb per hr. The Babcock & Wilcox Co., Boiler Div., 161 E. 42 St., New York 17, N. Y.

COST-SAVING FEATURES

of the B&W Integral-Furnace Boiler, Type FM

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and Gas Simultaneously
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

BOILER DIVISION

G-587

For more facts circle 516 on Reply Card

LIKE AN
ATOM-IC
EXPLOSION
Just 1/32" (pinhole size) faucet leak
MUSHROOMS into ATOMIC WASTE
of approximately 95,000 gallons •
of water yearly—costing!
$24.14
@ $1.90 per M cubic feet
If a hot water faucet, thus (actual) FUEL WASTED heating 95,000 gallons costs approximately:
$88.91 if coal (9870 lbs.)†
$91.08 if oil (792 gals.)†
$84.41 if gas (84,411 cu. ft.)†
Above figures authenticated by Hackensack Water Co.* and American Gas Association.†
STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with "SEXAUER" "Easy-Tites" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.
PAT'D.
"EASY-TITE"
FAUCET WASHERS
...a modern laboratory triumph, are compounded from du PONT NEOPRENE (tested up to 300°F.) instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day superheating water systems—that formerly broke down washer's structure.
Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLITS and MUSH ordinary washers out of shape...causing LEAKS.
Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold FAUCETS—thus you slash water, fuel and labor costs.
THE NEW 'SEXAUER' CATALOG
Edition G, just out, pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. Send for your copy today!
Then too, there's a SEXAUER TECHNICIAN within quick call from coast-to-coast, who offers a special SURVEY service that sets up a schedule of the exact replacement parts required for your particular plumbing fixture regardless of make or age and without obligation.
A postcard will bring him and your NEW Catalog promptly.
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2503-05 Third Avenue, New York 51.
as advertised in THE SATURDAY EVENING POST
SEXAUER
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS
For more facts circle 517 on Reply Card

BACKTALK

ing boilers only, and the figures for 100 psig pressure mentioned by Mr. Derby for process use will vary somewhat. A comparison of several designs of boilers for such service was given in my article 'Boilers and Their Housing in the Small Industrial Plant' published in the August, 1951, issue of PLANT ENGINEERING and I believe the relative costs given in the table in this article are still reasonably accurate.

"I quite agreee with Mr. Derby that requests for quotations on packaged boilers should be carefully worded and that all bids should be carefully compared. There are so many variations in the amount and arrangement of actual heating surface on which they are rated and the extent of the accessory equipment furnished by different makes that a fair evaluation of bids is often difficult. Also some makers regularly ship their units completely assembled while others ship the accessories in separate crates to be assembled and attached to unit by purchaser when unit is installed which also makes the comparison of bids more difficult." *William W. Gaylord, Consulting Engineer, Torrington, Connecticut.*

And the Author's Reply

"I believe the discrepancy in the package boiler cost of $1.00 per pound of steam, that Mr. Gaylord considers exists in my article, results from the fact that I was basing my comparison on installed costs of package boilers for (1) 'high pressure' or process service rather than for lower pressure heating and (2) capacities of 400 to 500 hp. I believe that Mr. Gaylord's figures are probably correct for low pressure small capacity boilers for heating service.

"My estimates also were based on a boiler installation in an existing building, with equipment cost only considered. Of course, we all realize that it is not too satisfactory to attach too much significance to installed cost per pound of steam or per horsepower since there are too many variables with regard to installation conditions, boiler ratings, etc.." *Robert E. Derby, President, Albert C. Wood Associates, Inc., Philadelphia, Pa.*

Symbols Will Prove Handy

PLANT ENGINEERING:

"Would you please send me tear sheets of the article 'Fluid Power Systems Solve Many Production Problems,' by H. L. Stewart, which appeared in the March issue.

"I particularly like the full sheet of symbols because I know it will prove handy in this office." *George Wagner, Plant Engineer, Vessel Division, A. O. Smith Corp., Milwaukee, Wisconsin.*

Likes Plant Engineering

PLANT ENGINEERING:

"I am plant engineer at Select Foods Products, Toronto, Ontario, Canada. I happened to be visiting a friend of mine who is plant engineer for Planters Peanut Co., Toronto. He had a magazine called PLANT ENGINEERING which I thought was very interesting.

"I wonder if you would be kind enough to send me the necessary information so that I can take out a year's subscription by return mail. Also you might send me a copy of your latest edition and bill me for same.

"From my observations I think your magazine is the best I have seen yet." *J. A. Edwards, Plant Engineer, Select Foods Products, Toronto, Ont., Canada.*

Editor's Note: You name has been passed on to our Circulation Department and, if your plant qualifies PLANT ENGINEERING will be sent to you without cost.

Seeks More Data on Zeprex

PLANT ENGINEERING:

"In the April, 1953 issue there is an article concerning Zeprex with the indication that additional information would be forthcoming from you if requested.

"Believe that with all the information given in the article that at the moment we would best be helped by knowing its cost and how the cost is figured, as well as the procurement situation on Zeprex.

"A few other things that are not made clear to us in the article are whether or not material can be sawed with a normal wood saw and how fast the saw would dull and whether it nails just as easily as does say medium soft pine." *Wm. G. Gray, Assistant Manager, St. Marys Kraft Corp., St. Marys, Georgia.*

Pipe Insulation Requests

PLANT ENGINEERING:

"We would like to have additional information on G-B Ultrafine Pipe Insulation as illustrated on page 85 of the June, 1953 issue." *K. D. Roberts, Plant Engineer, Plymouth Cordage Co., Plymouth, Massachusetts.*

PLANT ENGINEERING:

"Will you kindly send, marked for the attention of the writer, additional information on G-B Ultrafine Pipe Insulation. We are interested in various sizes and shapes of this product." *William Sharp, Plant Engineer, Standard Brands Incorporated, Hoboken, New Jersey.*

Editor's Note: Additional information on G-B Ultrafine Pipe Insulation is being forwarded to you by the manufacturer, Gustin-Bacon Manufacturing Co., Kansas City 5, Missouri.

Dust-Free Cleaning Paper

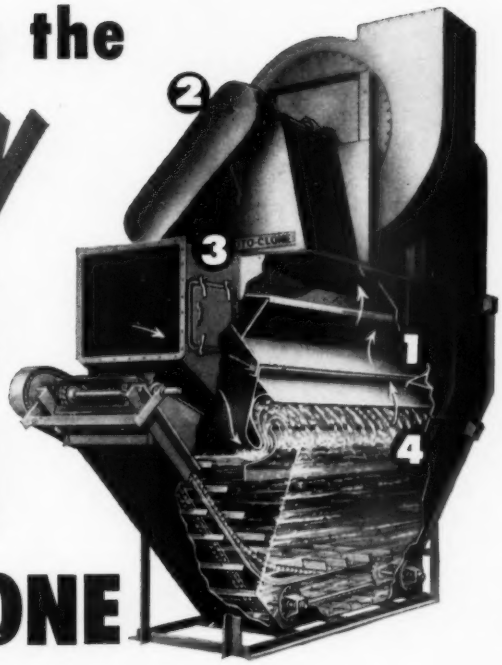
PLANT ENGINEERING:

"Your November, 1952 issue contained the interesting article 'Dust-Proof Production Line Builds Accuracy into Product.' The article mentioned 'dust-free special photographic lens cleaning paper' which would be useful to us if it were absorbent enough to replace the diaper cloths presently in use in our plant.

"Of particular interest is the 'dust trap' mentioned which is described as being a lint-free rug. We may have a possible use for this type of rug and would appreciate receiving further information from you on these two subjects." *Henry Larson, Assistant Supervisor, Fincl Assembly Methods, Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota.*

Editor's Note: A copy of your letter has been sent to Northrop Aircraft, Inc., Anaheim, California, for more detailed information on these items.

Introducing the NEW DESIGN 4 TYPE N ROTO-CLONE



—1—

Improved and simplified entrainment separators further reduce Type N's low cost maintenance.

—2—

Addition of 4 larger sizes to permit handling of exhaust volumes up to 50,000 cfm.

—3—

Additional access doors with improved hinges.

—4—

Greater range in permissible water over-flow rate from control box.

Famous AAF Hydro-static Dust Collector Loaded with New Features That Reduce Maintenance, Add Life and Lower Cost

The high dust collecting efficiency of the Type N ROTO-CLONE is written on the records of thousands of plants in scores of industries. Magnesium dust, buffing dust, lead oxide, lime and abrasive dust—all posed collection problems until the addition of this product to the ROTO-CLONE line.

The new Design 4 Type N, while retaining the proven cleaning action of its inverted S-shape water curtain, now adds features to further reduce and simplify maintenance, increase service life and *lower cost*.

Check the features listed here. No Gadgets—just sound engineering improvements that save you money both on first cost and every day of operation. For complete information on the new Design 4 Type N ROTO-CLONE write for Bulletin No. 277B.

Plus ADDED FEATURES FOR EACH TYPE N ARRANGEMENT

Arrangement B (Manual Sludge Removal)

1 Sloping sides for easier, faster manual clean-out.

2 Lower section designed for ready conversion from manual to automatic sludge removal.

Arrangement C (Continuous Sludge Disposal)

Heavier sludge ejector chain with longer chain pitch and slower speed—designed for longer life of all sludge ejector parts.

Arrangement D (Continuous Sluicing)

1 New drain control equipped with regulating orifice; built-in flushing connection and lubricated plug valve.

2 New water-supply control, complete with pressure regulator, which automatically assures constant water supply.

You Can Expect the Best from

AAF

American Air Filter

COMPANY, INC.

228 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

For more facts circle 518 on Reply Card

COOLITE GLASS lightens seeing tasks in MODERN LABORATORY

Installation of Coolite, Heat Absorbing and Glare Reducing Glass glazed in combination with clear vision strip.

22,000 Sq. Ft. of Heat Absorbing and Glare Reducing Glass Installed in New Lever Bros. Company Research Center

High levels of natural illumination help protect high standards of product quality and research in this carefully engineered structure. Luxlite Coolite filters out the unwanted factors in "raw sunlight"... reduces glare, absorbs excess solar heat... makes interiors cooler, more comfortable. Technicians see better, work better, feel better under softly tinted, filtered daylight. Coolite helps reduce eye fatigue in trying and important tasks. It helps create a pleasant working atmosphere... contributes to improved employee morale. But Lever engineers specified Luxlite Coolite for other important reasons — for glass and glass alone offers the time-tested performance needed for better daylighting at lowest cost.

Coolite Can Help Make Your Work Lighter

Consider Coolite for new construction or in modernization. The installation of Coolite is a positive investment to reduce rejects, cut maintenance costs and boost production.

New Lever Bros. Research Center, Edgewater, New Jersey. Architect: Skidmore, Owings & Merrill. Constructor: Bechtel Corporation. Glazing Contractor: F. H. Sparks Company.

There is no Substitute for GLASS!

It is non-combustible ... won't burn. It is rigid ... doesn't sag or warp. It has a permanently hard, impervious surface, not affected by time, abrasion or exposure to the elements. It won't corrode or stain. It resists chemicals — acids, solvents, etc. It is easily installed, maintained and cleaned by conventional methods.

Send for free Coolite catalog. Samples on request.

MISSISSIPPI *Glass* COMPANY

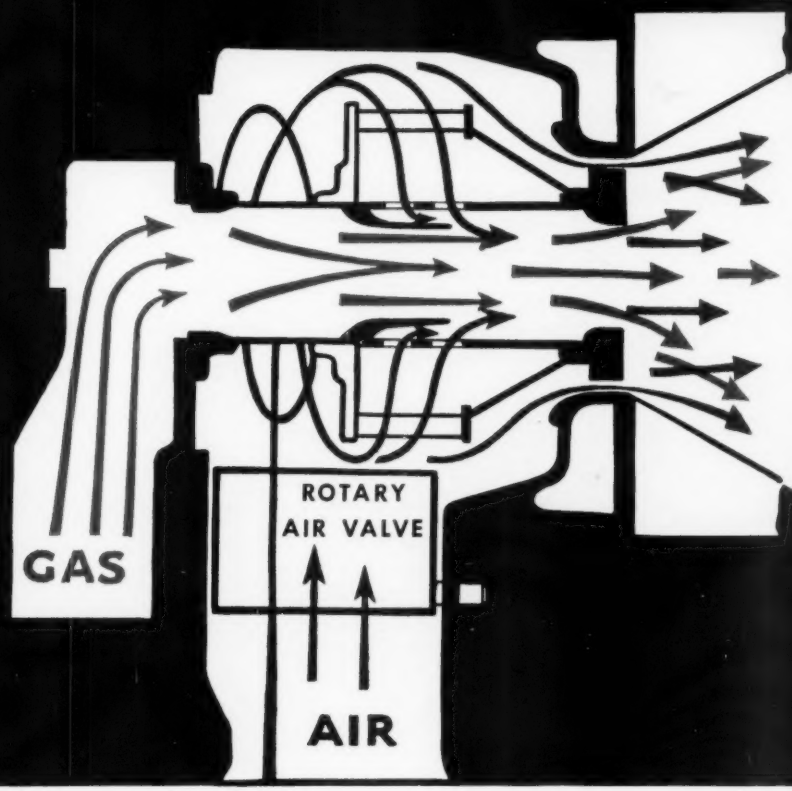
88 ANGELICA ST. SAINT LOUIS 7, MO.

NEW YORK • CHICAGO • FULLERTON, CALIF.

see our catalog in ARCHITECTURAL FILE or write for copy

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 519 on Reply Card



another cost-saving feature of POWERMASTER packaged automatic boilers!

The *VORIFLOW*® Gas Burner

Keeps fuel costs DOWN ... boiler efficiency UP

You can always depend on getting highly efficient and economical gas-firing with a Powermaster packaged automatic boiler because the Powermaster VORIFLOW gas burner gives you these operating advantages:

1. Infinitely Variable Combustion Modulation

Fully automatic control of fuel and combustion air responds instantly to load demands ranging from 20% to 100% of firing capacity—*with full efficiency!* There's no fuel-wasting combustion with the VORIFLOW gas burner because properly proportioned fuel and air are thoroughly pre-mixed to insure immediate ignition and complete burning upon entering the combustion chamber. All components of this unique burner are carefully sized for the Btu content of the gas supply and the heat requirements of the boiler.

2. High Efficiency Design and Construction

In the VORIFLOW burner, gas flows through the central gas nozzle from the gas plenum. Combustion air from the blower enters the air plenum, proportioned automatically by the motor operated rotary air valve. Primary pre-mixing air is captured by a stationary compressor wheel. This assembly directs the pre-mixing air through perforations into the gas nozzle against venturi-shaped air baffles. The gas and air are thoroughly mixed enroute through the gas nozzle. The outer air ring controls the amount of secondary combustion air admitted to the combustion chamber.

3. Immediate Change-Over to Alternate Fuels

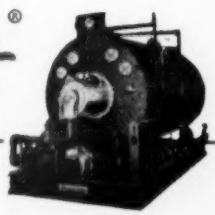
Conversion from gas to oil firing, or vice versa, with this VORIFLOW burner is accomplished in a few seconds on combination units. With the flick of an electric switch, the Powermaster modulating firing controls go into action as soon as the fuel change-over is completed. Latest development for gas firing of packaged boilers, this VORIFLOW burner is one of many reasons why Powermaster is so widely preferred for industrial plants, dairies, hospitals, laundries, schools, public buildings, institutions, and other steam and hot water boiler requirements.

Send for this new bulletin to get the full story of Powermaster's many cost-saving features.

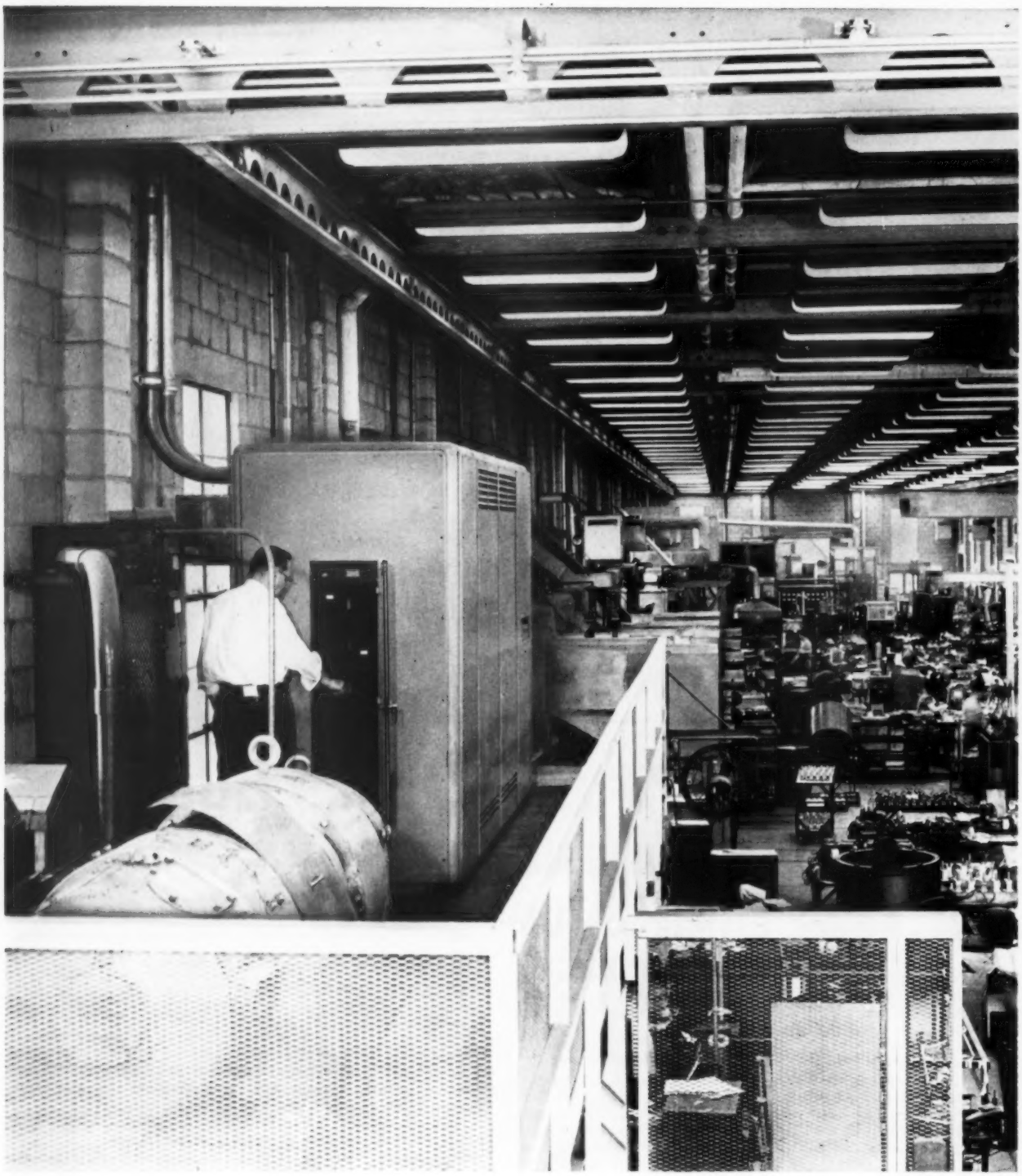
Powermaster®

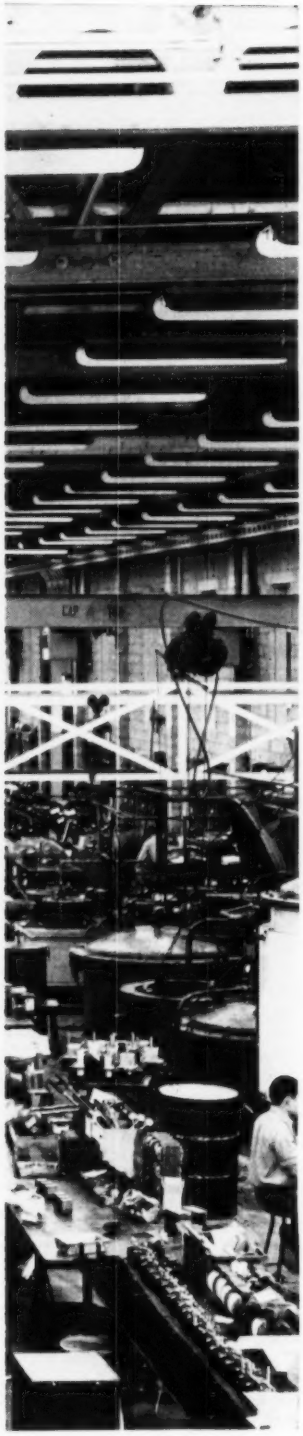
PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP, pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **840 Morgantown Road, Reading, Penna.**





Here's how Westinghouse power centers increase plant output...safely

Safe, efficient power distribution that actually helps increase plant output... that's what this Western Pennsylvania manufacturer realized by installing modern Westinghouse dry-type power centers.

Dry-type power centers minimize installation costs because they are completely safe. Since they are *both* fire and explosion resistant, they can be located right in the production area. They require no vaults, catch basins, toxic gas vents, or drains. Lightweight, they can be suspended overhead, releasing valuable floor space for production. This makes it easier to locate them close to the load they serve, shortening secondaries, cutting line losses, improving regulation. The result: Increased production efficiency.

In the plant pictured at the left, two Westinghouse power centers divide the load. Capacity is provided in each to allow for expansion.

Add these up for your plant: (1) Safe, economical installations. (2) Increased production space. (3) Increased plant efficiency through improved regulation. (4) Savings in power cost through reduced losses. (5) Savings in heavy copper through shortened secondaries.

Westinghouse power centers can bring these advantages to your plant, too. Because they are factory assembled and coordinated as one unit, with components designed to meet your individual requirements, they can be installed quickly and easily. For further information, check with your contractor, your Westinghouse distributor or local representative, or write direct to Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.

J-70708

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 521 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Tank Shell Built from Top Down

WHEN MISSISSIPPI Chemical Corporation expanded its Yazoo City plant, it ran into an unusual construction problem.

A new prilling tower was the job —a 20 ft dia, 120 ft high aluminum shell used to convert liquid nitrate into fertilizer. Because of the chemical process requirements and the extremely close tolerance specifications, the tower had to be erected from the top down, instead of by the usual ground-up method.

Another requirement was that the tower's interior had to be absolutely smooth because ammonium nitrate has a tendency to collect on any protrusion.

The builder of the tower, Girdler Corporation, was forced to weld the 64 aluminum plates that constitute the shell. Because of the lack of clearance between the aluminum shell and its supporting steel tower, all exterior reinforcing angles had to be left off until the shell was completely erected. This required extra strong welds.

Then, as if the job weren't already complicated enough, a decision was made to minimize scaffolding and need for moves by doing all welding from one spot. This meant that the upper aluminum shell sections were assembled first, (at the low level), then raised as new sections were added below.

Sections of aluminum tank shown under construction were welded inside supporting tower and raised into position

The tank shell was made up of 16 rings of aluminum plates, each ring forming four segments. The tower's top ring of plates was assembled and welded, then raised out of the way so that the next four plates could be welded into a ring below it. Then the first and the second rings could be welded together. Thus, one by one, the rings were completed and joined together. *From Kaiser Aluminum News, published by Kaiser Aluminum & Chemical Corporation, Oakland, California.*

Circuits by Photo-engraving

TO A CERTAIN point, the process used in mass-producing miniature electronic package assemblies at Boeing closely resembles the process by which drawings become printed cartoons on comic pages.

The artists in this case are the electrical engineers who draw up master circuit drawings which look like ordinary circuit diagrams. The master circuit drawing has heavy lines leading from one terminal to another; and the process of photo-engraving reproduces those lines exactly, as electrical conductors, ten or hundred or a thousand times.

The process begins when workers in the photo template shop make a photographic negative of the master circuit drawing prepared by the electrical engineers. The negative is then placed against a sheet of

Parts Take Merry-Go-Round Ride and are Dipped Clean Before Welding

A CONVEYOR that resembles a merry-go-round is used by the Bell Aircraft Corporation for the cleaning of rocket, aircraft, and missile parts prior to spot welding.

The parts to be cleaned are hooked to one of the arms of the conveyor and are then lowered into a vat where a salt solution removes any grease. They remain in this solution for approximately two minutes.

By means of this merry-go-round conveyor, parts are immersed in tanks containing different liquids until cycle is completed and pieces are ready for welding

The conveyor then rises and turns until the arm is directly over the next vat containing an aluminum cleaner, in which the parts stay for six minutes. Then the parts are moved to the next vat.

This one contains hot water to rinse the parts of any excess cleaner. The fourth vat contains a deoxidizer and the fifth, cold water for the final rinse.

The merry-go-round has now completed one revolution and after being dried with an air hose the parts are ready for the spot welders.

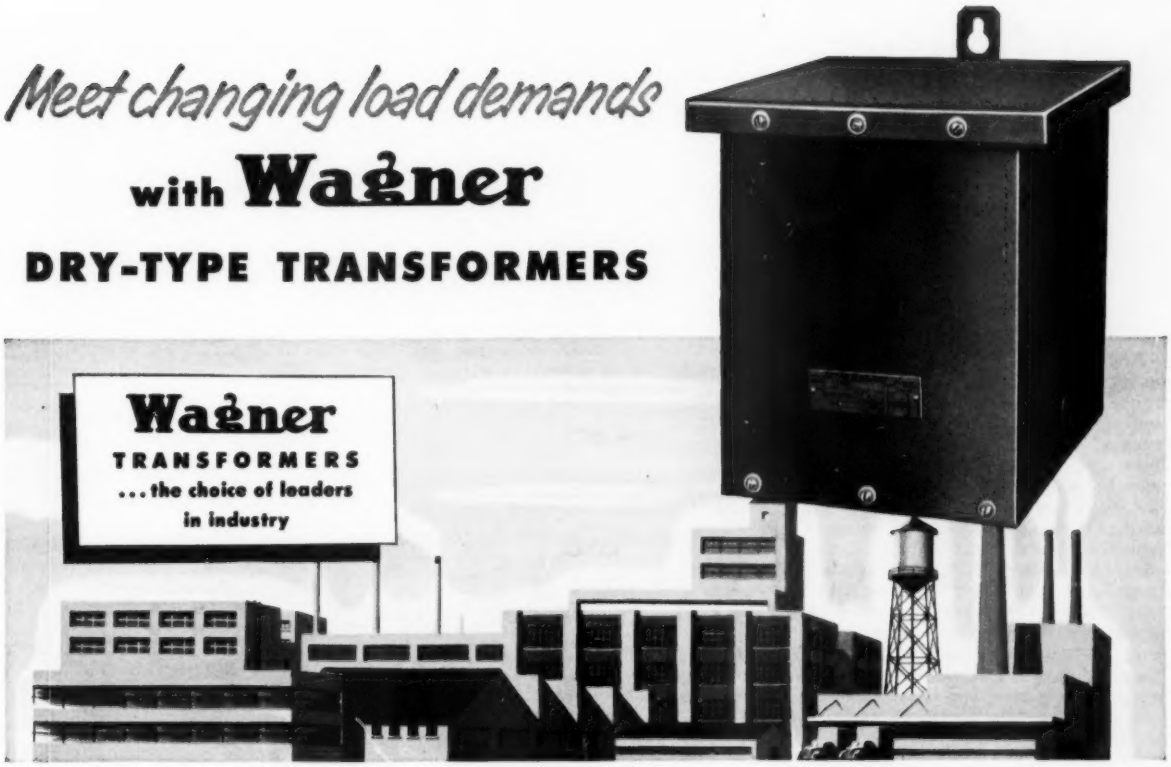
A precaution taken to help make absolutely sure that liquids in the vats are at proper strength is to dip small metal strips in the solution. These strips are of exactly the same material as the larger parts and after being removed are tested by the welders.

If the strips can pass the test, then the parts are attached to the arms of the conveyor for the trip around the vats. *From Bell Aircraft News, published by the Bell Aircraft Corporation, Buffalo, N.Y.*

Meet changing load demands

with Wagner

DRY-TYPE TRANSFORMERS

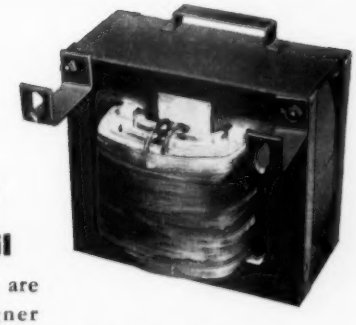


Wagner dry-type transformers can solve your problems by putting the right voltage close to the load wherever machines, portable tools or lights require voltage changes.

SAFE- Wagner dry-type transformers meet all requirements for indoor installation. They will save you money on insurance premiums. Fireproof vaults or other special protection are unnecessary—even where fire hazards are present.

ECONOMICAL- When you use Wagner dry-type transformers, you reduce installation costs—you reduce line losses—you eliminate long runs of secondary copper—and you can forget about maintenance.

COMPACT- Wagner dry-type transformers are small in size—light in weight—easy to install and easy to move whenever changes in plant facilities make it necessary.



Form W

Core and Coil

These transformers are built in the Wagner Form W design with cores of cold rolled oriented grain transformer steel which permits less weight per kva and small size cases for space-saving installation.

80° C Rise — Class B Insulation

Safe operation is assured through the use of class B inorganic insulation throughout the coil structure. Liberal ventilating ducts provide high short time overload capability. Available in sizes 3.0 to 100 kva, 600 volts and below.

WAGNER ELECTRIC CORPORATION
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

753-7

For more facts circle 522 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

phenolic plastic on one side of which is bonded a sheet of copper 0.003 in. thick. The copper is covered with a photo-sensitive, acid resistant enamel called cold-top.

Negative and plastic sheet are exposed to the glaring blue of arc lights. Black portions of the negative stop the light while the colorless lines of the wiring diagram let the light go through and harden the cold-top enamel underneath.

A bath in developing solution then washes away the cold-top enamel which was not hardened by exposure. A further bath in an etching tank containing ferric chloride solution dissolves the copper not protected by the enamel, leaving the wiring diagram in copper on the phenolic sheet. The remaining cold-top enamel is removed from the copper with special scouring powder and the circuit wiring is complete.

Like a painting that has somehow come to life, the drawing of the electronic circuit has been transformed into the circuit itself. The tiny strips of copper—all that remain of the copper sheet—have become wires.

Component parts, mounted on the side of the sheet opposite that on which the circuit has been etched, are connected to the circuit by means of pins which go through the drilled holes. They are made fast to the circuit by floating the entire phenolic sheet, circuit side down, in a solder bath. When it is removed, all parts have been soldered in place; and the complex electronic assembly is completed.

The etched-wire circuits are inherently rugged and stable. They tend to eliminate wiring errors and variations in quality which may result from fatigue. *From an article by John Newland, in Boeing Magazine, published by Boeing Airplane Company, Seattle, Washington.*

Save Time — Pneumatically

PNEUMATIC tube systems have joined the modern trend toward wider applications for increased economy and efficiency.

Many people think of a pneumatic tube system only in its most widespread use, that of retail store cash handling, without realizing the diversification of industrial installations which have been made in recent years.

This is an array of articles that can be quickly transported by pneumatic tube

Where pneumatic tube systems are already installed and functioning with high speed efficiency, the usefulness of the system can be extended very easily.

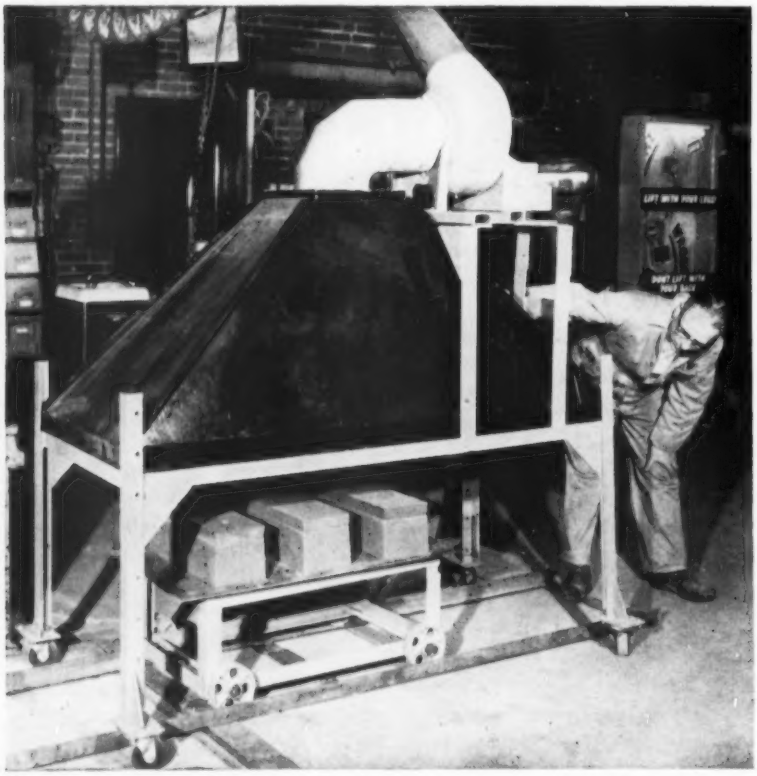
The twist drills and adjustable wrench in the illustration are symbolic of small tools which are transported between tool rooms and strategic production points in many factories. Bottles containing chemicals, test samples, and medicines are characteristic of fragile loads frequently handled in hospitals and institutions.

Paper work, and correspondence represent probably a great single industrial use of pneumatic tube equipment. In offices, ink, insecticide sprays or any type of desk supplies can be routed in pneumatic tubes to save extra steps and wasted time.

The cast of metal just in front of the tube-carrier in the illustration is transported from the alloying department to the laboratory for analysis in a major non-ferrous metal manufacturing plant, while still hot. This is one of the most unusual of modern pneumatic tube uses.

There may be many extra jobs which can be devised for the pneumatic tube system now installed in your office or plant. *From a release for Lamson Corp., Syracuse, N. Y.*

Exhaust Hood Travels to Ventilation Jobs on Its Own Wheels



This exhaust hood was designed by Harry Saunders, observing, and built with help of men in the Battelle foundry. Angle iron legs have drilled holes for elevation adjustment. Casters simplify job of moving hood where needed. (From the Battelle News, published by Battelle Memorial Institute, Columbus, Ohio)

Rapid Concrete Drilling

A FORMIDABLE drilling problem was overcome by the Bertke Electric Co., Cincinnati, Ohio, electrical contractors, during construction of the Cincinnati Veterans Hospital.

The job required two four-inch holes to be made through 15½ in. of concrete, in which was imbedded a half-inch steel "I" beam. Drilling was especially difficult because the holes were to be located a few inches below the ceiling.

Skids were erected to support the 1¼ in., 150 rpm drill motor. A horizontal pressure bar, attached with

(Continued on page 38)

KIMBLE TOPLITE

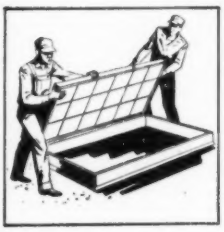
a new system for daylighting deep rooms

New Kimble Toplite Panels solve the problem of how to provide daylight for deep interior areas too far removed from conventional, side-wall panels of prismatic Insulux Glass Block®.

This revolutionary new daylighting system lets you bring free daylight in from above through a simple framed, flat roof without monitor, saw tooth, or clerestory arrangements.

Only the Kimble Toplite offers these features:

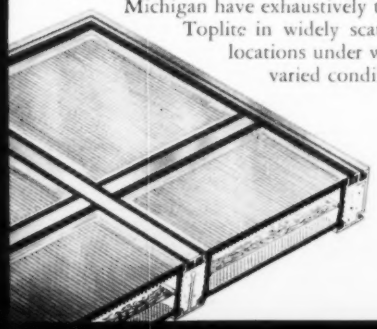
PREFABRICATION

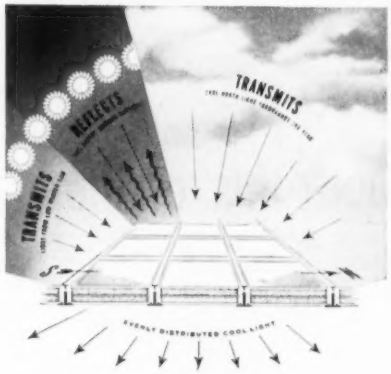


Kimble Toplite panels are factory-fabricated for uniform quality, and low installation cost. They are made up of an insulated aluminum grid into which special hollow glass units are set. The glass units are 10⅝″ square by 3″ thick, and are installed in the grid 12″ on centers. Panels are weatherproof with no porous materials exposed to the weather.

TESTED, TIME-PROVED CONSTRUCTION

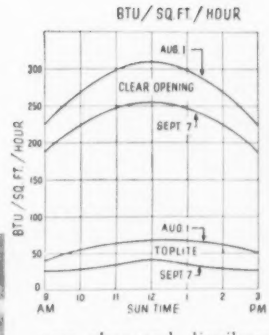
Kimble Glass Company, in conjunction with a leading roof light manufacturer, and the Daylighting Laboratory at the University of Michigan have exhaustively tested Toplite in widely scattered locations under widely varied conditions.





SELECTIVE CONTROL OF DAYLIGHT

Kimble Toplite Panels are selective in their light transmission. They transmit a high percentage of the light from the low winter sun and from the north sky but reflect much of the direct light from the high summer sun. Light-controlling characteristics eliminate glare and distribute daylight evenly throughout the room.



Calculated total heat gain through a Toplite Panel as compared to a clear opening in a horizontal roof for a building located at 37° N. Latitude.

SOLAR HEAT REDUCTION

Panels are designed to reflect hot summer sun and have unusual ability to reduce solar heat transmission. Toplite panels have high insulating value thus reducing troublesome condensation during winter. Loads on heating, air conditioning and artificial illumination systems are reduced.

More information

Want more information about this great advance in daylighting? Send for the new, free bulletin: "Kimble Toplite—a new system in daylighting." Address: Insulux Glass Block Division, Kimble Glass Company, Dept. **PE-8,** Box 1035, Toledo 1, Ohio.

MANUFACTURERS OF INSULUX GLASS BLOCK

KIMBLE GLASS COMPANY

Toledo 1, Ohio—*Subsidiary of Owens-Illinois Glass Company*

...with TYCOL lubricants on hand!

A Cutting Oil with a "Delicate" Touch! Screw threading to fine tolerances is the acid test of any cutting oil . . . one reason why we ask: can your present oil measure up to Tycol Angrove 40? Take the customer who was threading 3/8" standard threads on 303 Stainless . . . with thread extending to the head . . . and the overall job calling for an extremely fine finish. The best of the competitive oils used yielded only 600 pieces before serration and burring appeared, necessitating regrinding the chaser. Tycol Angrove 40 produced some 4,500 pieces with no defects apparent under magnification . . . and with no regrinding of the chaser throughout the entire run! If you can't top this – contact your local Tide Water Associated office for further information!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

For more facts circle 524 on Reply Card

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17 BATTERY PLACE - NEW YORK 4, N.Y.

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 For "Floor Level" Handling—Junior Catalog 535 is the 100-pp eleventh edition of company's well known pocket-size catalog. Contains information, illustrations and specifications on fork trucks, high lift electric trucks, pallet trucks, industrial tractors, electric and hand lift trucks, steeleg skids and boxes, semi-live skids and lifters, portable elevators and cranes, stacking frames, storage racks, die tables, handling specialties. Barrett-Cravens Co.

102 Fork Truck of the Future—Vol. 13, No. 1 of this company's Material Handling News features the new experimental Model X-70, a streamlined fork truck incorporating suggestions of long-time truck users and ultra-modern ideas of design engineers. A questionnaire is included for plant engineers to express their approval or disapproval of the X-70. Other pages of this 16-pp magazine delineate manufacturer's entire line of trucks, tractors, and attachments. Clark Equipment Co.

103 Cable Conveyors—Bulletin 40 shows three types of power driven cable conveyors—two of the overhead trolley type, and a table conveyor with four-wheeled carriers. Applications for these cable conveyors are discussed, and information is included on load limits, carrier spacing, specifications. The R. W. Buschman Co.

104 Transmission, Conveying Equipment—Bulletin 53-110, 56 pp, is described as an abbreviated catalog on cast and steel chains, cast tooth sprockets, belt conveyor idlers and spray nozzles. It presents the story of corrosion- and abrasion-resistant Rex-Z-Metal, gives chain listings and prices and sprocket information. Take-ups, buckets, idlers, spray nozzles and chain attachments are also listed. A pictorial index to equipment covered is included. Chain Belt Co.

105 Materials Handling Equipment—Illustrated in 31-pp, Form 31, are over 100 pieces of materials handling equipment. Among the items illustrated are skids, pallets, stackable pallets, pallets and skid boxes, racks, trucks, trailers, dump hoppers, car plates, truck plates and special equipment. Pab-Weld Corp.

106 Modern Materials Handling—New methods in bulk and packaged handling are pictorially described in this 12-pp brochure. Versatility and flexibility of equipment in operation above or under ground is illustrated by "on the job" pictures. The importance of releasing manpower for productive work by mechanizing materials handling is stressed. Capacity, horsepower, weights and other data on equipment and attachments given. Tractor Div., Allis-Chalmers Mfg. Co.

107 Casters and Wheels—A complete line of casters and wheels is presented in 8-pp Bulletin C-1. Single- and double-ball race swivel casters, incorporating company's Lockweld construction without a king-pin, are detailed in photos and tabular dimensional data. Featured in the bulletin are company's new vulcanized rubber tired wheels available in sizes from 3 to 6 in. The Fairbanks Co.

CONSTRUCTION AND MAINTENANCE

108 Modular Construction—"The Modular Method for Lower Industrial Construction Costs," 12-pp, covers modular industrial buildings and shows possibilities offered by standardization of building units and components. By standardization, a standard plant or warehouse module or a standard office module can be assembled in any numerical combination or pattern to form the desired building. The Ferber Co.

109 Waterproofing Membrane Fabric—The use of Fiberglas in company's waterproofing membrane is told in "Let's Look At Membranes," 16 pp. Comparisons of Glasfab and other types of membranes are drawn, and complete application methods described. Several case histories, covering industrial roofing jobs, highway bridges, pipe lines and chemical piping, show versatility of product and how it is applied, with a waterproofing compound, to seal many surfaces. Twinsburg-Muller Corp.

110 Coatings for Chemical Industry—Advantages and use of synthetic resin-base coatings in the chemical industry are described in this 8-pp brochure. Presents 16 industrial case histories. Specific applications of coatings based on Bakelite and Vinylite resins described include tank cars, oil pipe, acid tanks, sewage disposal plant, shipping containers, plating rack and steel tubing. Also included is tabulation of effects of various chemicals on vinyl resin-base coatings. Bakelite Co., Div., Union Carbide and Carbon Corp.

The Reader Service Card below needs no postage. Just circle item numbers of all bulletins wanted. Be sure to include your name, your job title and company name.

111 Sprayed-On Insulation—Bulletin 53-4, 8 pp, describes company's cold-application insulating material, composed of insulating fillers of cork and asbestos, with a bituminous base. The material can be applied directly from the drum by hand-operated sprayguns. General application practices are discussed, and specific applications, such as for insulation, waterproofing, vibration dampening, sound deadening are outlined. Witco Chemical Co.

ELECTRICAL, LIGHTING

112 Motor-Generators—Bulletin 30-200, 6 pp, describes motor-generators from ¾ to 1500 kw. Shows 23 designs of a-c to d-c, a-c to a-c, d-c to d-c and d-c to a-c motor generators. Electrical specifications are given. The Electric Products Co.

113 Generator Insulation Testing—Now available to plant engineers is an 8-pp report on high voltage d-c testing of generator insulation. The paper presents a comparison of a-c and d-c high voltage testing, with suggested procedures for insulation testing. The John Hewson Co.

114 Insulation Resistance Testing—Designed around the use of company's Vibrotest insulation resistance testing instruments, this practical 50-pp manual covers virtually the entire field of insulation resistance testing in a plain language, how-to-do-it style. Gives directions for testing many types of electrical equipment and systems, and discusses value of continuous record keeping. Booklet is available to

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11	12	13	14	15	
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26	27	28	29	30	
31	32	33	34	35	
36	37	38	39	40	
41	42	43	44	45	
46	47	48	49	50	

BULLETINS

101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116
117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148
149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164
165	166	167	168	169	170	171	172
173	174	175	176	177	178	179	180

DATA FILE

201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234
235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251
252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268
269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302
303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319
320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336
337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353
354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
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qualified plant engineers, electrical engineers and electricians; please state your job title when requesting this. Associated Research, Inc.

115 Toggle Switches—Catalog 73, 8 pp, provides comprehensive information on company's 11TS series. Well illustrated, charts give characteristics, electrical ratings, and AN and JAN listings. Micro Div., Minneapolis-Honeywell Regulator Co.

116 Manual on Demand Meters—Booklet GET-2327, is a 48-pp well illustrated manual on demand metering. Describes in detail the theory, economics, operation and application of demand meters. Provides an excellent summary of principles and problems of demand metering; a reference for helping in specific demand-measuring application; and a simple textbook for trainees. Rather than emphasize details of meter construction, installation or maintenance, this manual serves as a centralized source of basic information. General Electric Co.

117 Miniature Selenium Rectifier Stacks—Illustrated Bulletin GEA-5935 contains data on the applications, construction features, and electrical characteristics of the small selenium rectifiers. Includes tables of ratings and dimensions, plus graphs of the effect of temperature and life expectancy. General Electric Co.

118 Across-the-Line Starters — Bulletin 14B7132A, 8 pp, describes company's Size 0-3 across-the-line motor starters, covering manual and magnetic types, and combination and reversing as well as push button control stations. Operating arrangements are described and three types of enclosures shown. A table shows motor voltage and motor maximum hp (three phase) applicable. Allis-Chalmers Mfg. Co.

119 Industrial Truck Batteries—Bulletin IT-520 covers company's complete line of industrial truck batteries and gives details such as dimensions, wet and dry weights, types of containers, and capacities at the 6- and 8-hr rate. C&D Batteries, Inc.

120 Plating Power Supplies—Sixteen-pp Booklet GEC 970 describes a line of manually-controlled and automatically regulated metallic rectifier power supplies for electroplating and similar processes. Fully illustrated, it presents the advantages, applications and operation of the units and lists ratings. General Electric Co.

121 Lighting Fixtures—New Section K of Conduit Catalog 3000 describes components, performance data, and methods of relamping for any of the manufacturer's new EV series explosion-proof and weather resistant lighting fixtures. It contains illustrations showing steps for easiest relamping and installation of this type of fixture. Crouse-Hinds Co.

122 Outdoor Lighting—Illustrated Bulletin, GEC-967, 8 pp, tells how the G-E Form 109 street-lighting luminaire can be used with mercury-vapor or filament lamps, including data on application, construction, and conversion from one type to another. General Electric Co.

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HEATING

123 Heat Curtain for Doorways—Bulletin 560-61 shows how a "heat curtain" was designed to solve the problem of cold air inrushing through open doors. Explains how two combination oil- and gas-fired space heaters were equipped with duct-work to heat a 23,400 sq ft metal working plant, with duct system so arranged that one heater carries load in mild weather. Dravo Corp.

124 Heating Coils—Illustrated Catalog 4553, 36 pp, presents manufacturer's heating coils for steam and hot water. Contains general coil descriptions and construction data as well as selection and dimension information. Includes valuable piping, installation and specification details. Young Radiator Co.

125 Heat Exchangers, Storage Heaters—Sixteen-pp Catalog 5 covers more than a dozen types of hot water storage heaters and heat exchangers, including horizontal and vertical hot water storage heaters, instantaneous water heaters, convertors, condensate coolers. Tables assist in selecting correct equipment for given operating conditions. Patterson-Kelley Co., Inc.

INSTRUMENTS, CONTROLS

126 Pump Recirculation Control—Eight-pp Bulletin S-53 describes control systems for protecting high capacity centrifugal boiler pumps during low load conditions. By recirculating water through the pump during these conditions, these systems serve to prevent overheating and binding at joints. Information on determining when such a system is needed is included. Both electrically and pneumatically operated systems are discussed, and their operation and arrangement illustrated. Republic Flow Meters Co.

127 For Measuring Vacuums—Catalog 7001, 32 pp, describes many types of pressure and vacuum gages used to measure vacuums up to 10-11 mm of mercury and pressures as high as 150,000 psi. Presenting information in tabular form, the catalog covers indicators, recorders, pneumatic and electric controllers and pneumatic transmission. Illustrations include diagrams of typical control systems. Industrial Div., Minneapolis-Honeywell Regulator Co.

128 Condensate Drainage Control—General Catalog 500, 16 pp, describes a condensate drainage control unit designed to combine functions of steam trap, air bypass, check valve, strainer, sight glass, temperature indicator and control. Explains value of bimetal principle utilized, and the operation of the heat-pressure system. Other advantages of this universal trap are discussed. Velan Engineering Co.

129 Industrial Television Equipment—Catalog E describes and pictures camera, monitor and viewing equipment for use in industrial televiewing applications. Explains operation, special features, lists applications. Radio Corp. of America.

PIPING, HOSE, VALVES

130 How Pressure Piping Is Made—A detailed description of how pressure piping is fabricated for industrial use is given in this 16-pp booklet. Pictures shop facilities and steps taken in producing prefabricated piping for power generation, refining, pipe line transmission, paper, steel and chemical industries. Illustrations show assemblies made from carbon and alloy piping. Western Piping Supply Div., The Lummus Co.

131 Dangers Under Pressure—This 8-pp safety booklet is intended to help hose users avoid accidents and get long, trouble free service from hose and couplings. Fully illustrated, points out potential hazards involved in the use of high pressure hose, and shows how to handle it. Also covers the proper selection and use of hose couplings. Hose Accessories Co.

132 Industrial Fire Hose—Described in this 6-pp bulletin on industrial fire protection hose are chemical and booster types, single and double jacket cotton rubber lined, space saving flat folding type, engine suction and other types. Well illustrated with photos and cross sections,

(Continued on page 133)

figure replacement costs by the hour—

NOT
by the pane

Most of the cost in replacing broken windows is the cost of labor—not the cost of panes. Surveys show the average installation cost of a 12″ x 18″ pane is $3.00—and $2.65 of this goes to labor and factory overhead. By preventing window breakage you can reduce maintenance costs.

Glazing with PLEXIGLAS acrylic plastic is a good way to prevent breakage. Strong and resilient, this light weight, durable, outdoor plastic withstands impact, twisting, and vibration—worst enemies of industrial glazing.

PLEXIGLAS is supplied as clear material, and in translucent or transparent colors that diffuse daylight, cut down direct sky glare, or reduce solar heat. We will be glad to send you the names of dealers in your vicinity.

OUR NEW BOOKLET

"Window Glazing with PLEXIGLAS", tells the advantages and uses of this glazing material. To lower your maintenance costs, write for it today.

PLEXIGLAS is a trademark, Reg. U. S. Pat. Off., and other principal countries of the Western Hemisphere.

Canadian Distributor: Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.

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CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

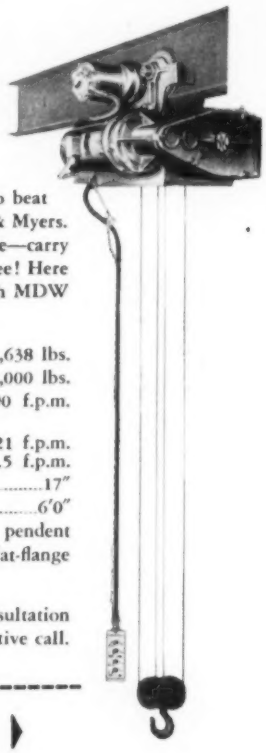
53% WANTED GREATER VERSATILITY

Handling Too Specialized

It was the conclusion of the ASTE study that present day materials handling equipment is too specialized to meet the requirements of our nation's expanding economy. Apparently companies feel that they have to invest too much money and floor space in a variety of specialized types of materials handling equipment, and think that more versatile types could be created by the equipment suppliers.

Of the respondents to the survey, 53% were of the opinion that more versatile materials handling equipment is needed in contrast to only 13% who were of the opinion that equipm... should be more specialized ... equip...

From key plant survey report published by THE TOOL ENGINEER.



For versatility, and simplicity it's almost impossible to beat a "Freeway"* handling system engineered by Robbins & Myers. Hoists occupy no floorspace—mighty little ceiling space—carry anything—are tough, compact, efficient, and trouble free! Here are leading facts on the R&M model F55-F2 hoist with MDW powered trolley.

WEIGHT (complete unit)	1,638 lbs.
PAYLOAD (on the hook)	4,000 lbs.
TROLLEY SPEED (regardless of load)	80-90 f.p.m.
HOIST SPEED (regardless of load)	
single speed type	21 f.p.m.
two speed type	21/5.5 f.p.m.
HEADROOM (no load, hook up)	17"
TURNING RADIUS	6'0"
CONTROL	4 push button pendent

INSTALLATION—fits 8" to 20" standard I-beams, flat-flange beams, and patented monorails.

Write for "F" series hoist Bulletin No. 801-C. For consultation or advice (no obligation) ask that an R&M representative call.
**Materials handling on a separate overhead level.*

hang handling problems on this hook ▶

name _____

position _____

company _____

address _____

TAKE IT UP WITH

ROBBINS & MYERS INC

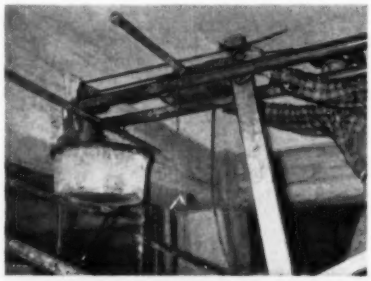
MOTORS HOISTS CRANES FANS MOYNO PUMPS

HOIST AND CRANE DIVISION, SPRINGFIELD 99, OHIO

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)



Workman uses special rigging to drill 4 in. holes near ceiling. Bottom view shows one of the cores that was produced by the tungsten carbide drills. Note the slug of steel in the center

wing nuts to two threaded rods which were anchored to the wall, placed against the rear of the drill motor. The wing nuts were tightened, while the drilling progressed, to eliminate undesirable play.

A 2x4 was used between the pressure bar and the motor case to protect the motor and give additional leverage. Water was used to flush cutting debris from the holes, and as a coolant during the job.

The drill used for this job had eight tungsten carbide cutters and a patented core slot in the side of the drill body for easy removal of the core. *From a release for the Tilden Tool Manufacturing Company, San Clemente, California.*

Cure for Thread Galling

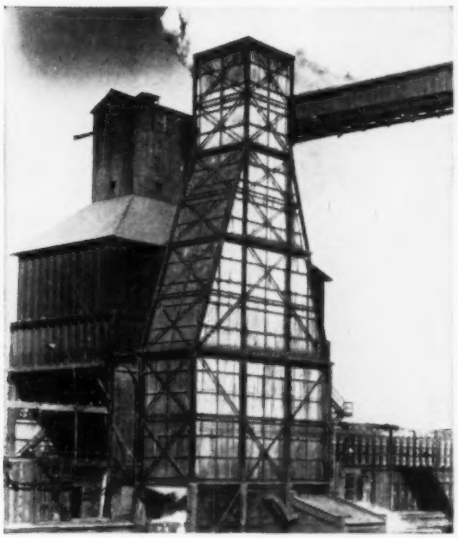
METAL PARTS, held tightly together for a long time, are hard to separate. In the operation of boilers, where heat and moisture create an oxidizing atmosphere, this tendency to stick together is aggravated.

To prevent galling and sticking of bolts and nuts, the Besler Corp. of Oakland, California, which manufactures steam generators and special thermal equipment uses a concentrated dispersion of colloidal graphite in oil.

The graphite coating formed is unaffected by temperatures of nearly 1000 F to which fittings on Besler's steam testing units have been exposed continually. Not only does graphite retain its extremely low coefficient of friction under such

CORRUGATED *Asbestos* TRANSITE*

Defies corrosive fumes



The outside structural steel framing of this coke quencher station is being effectively protected against the severe and destructive steam and acid fumes by Johns-Manville Corrugated Transite.

Defies corrosive moisture

J-M Corrugated Transite resists the deteriorating effect of severe seacoast wind and salt spray conditions—gives long, maintenance-free service in moisture-laden lake and river front areas.

You build economically and quickly with these versatile fireproof and weatherproof asbestos building sheets

In the past quarter century, Johns-Manville Corrugated Transite has proved an ideal material for roofs and for sidewalls of industrial, commercial, institutional and agricultural buildings. Made of asbestos and cement, the large sheets are easy to handle, go up quickly with a minimum of framing. Practically indestructible, Corrugated Transite is fireproof, rotproof, weatherproof; needs no paint or special treatment to preserve it, and can be salvaged and re-used if necessary.

Today, Corrugated Asbestos Transite is also used increasingly for smart interiors . . . the streamlined corrugations and attractive shadow lines that give it such unusual architectural appeal for exteriors offer unlimited interior design possibilities.

• • •

Investigate J-M Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. PE, New York 16, N. Y. In Canada write 199 Bay Street, Toronto, Ontario.

*Reg. U. S. Pat. Off.

EASY TO FASTEN TO STEEL

EASY TO SAW

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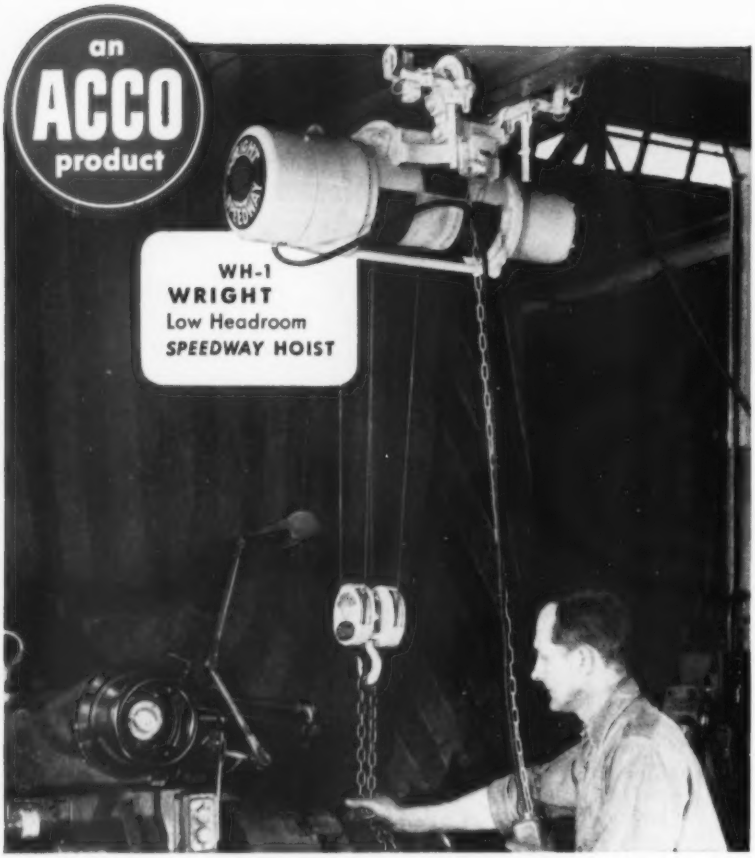


Is Hoist Headroom a Headache for You?

• Look at this. The bearing point of the hook of this **WH-1** Low Headroom WRIGHT *Speedway* Hoist can be raised so it is only 12¼ inches below the beam. And this is a 1-ton hoist with the five key features that make WRIGHT *Speedways* last longer and require less servicing.

This hoist has heat-treated and surface-hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake, and ball bearing gear shafts.

Add to this grooved cable drums, improved plow steel preformed cable, concealed motor wiring, completely enclosed and ventilated weatherproofed housing, etc., and you'll have a combination of features found only in the WRIGHT *Speedway* Hoist.

Best of all—WRIGHT *Speedways* are priced no higher than ordinary hoists. In the long run they'll cost you less.
So see your WRIGHT Hoist distributor today for full information or write our York, Pa., office.

ACCO

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

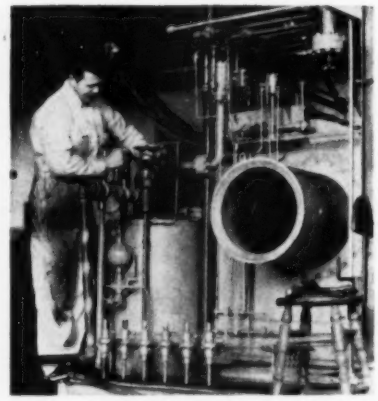
York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

WRIGHT
Hoists
Trolleys
Cranes

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)



A Besler employee is shown applying concentrated dispersion of colloidal graphite in oil to boiler valve stem

circumstances, but it also resists oxidation and acts to inhibit corrosion. *From a release for Acheson Colloids Co., Div. Acheson Industries, Inc., Port Huron, Michigan.*

Bars Bar Material Sticking

AFTER a new cyclone was put to use at the Pittsburgh, Pa. plant of the Armstrong Cork Co., it was found that production was hampered by static.

Charges generated when material was blown through a duct system at high velocity caused it to cling to the sides of the cyclone. A mat 2 to 3 in. thick was formed, making it practically impossible to move the material out of the cyclone.

Problem was solved by the installation of three static control bars inside the cyclone. The bars were installed in such a manner that the static-laden material would have to blow past them.

As a result sticking and matting of the material was completely eliminated and full capacity operations were restored. *From Hewson Problem Solutions, published by the John Hewson Company, New York, New York.*

Compressed Air Removes Swarf

SWARF removal in a production grinding department is sometimes considered an unattractive, messy job. However, this is not the case at the Grinding Machine Div. plant of the Norton Co. in Worcester, Mass. Here, the cleaning of coolant tanks is regarded as a fairly clean operation and is done with ease and rapidity. The reason lies in the use of a specially designed portable tank.

Prior to its introduction, electri-

cally powered gear pump tanks were used. These resulted in frequent breakdowns and high maintenance costs.

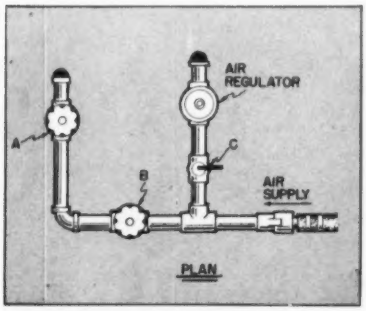
With the new type of disposal unit, manual operation is practically limited to opening and closing a few valves. Compressed air at about 90 psi does the work. A 20 ft intake and discharge hose is attached to a 2 in. pipe at the bottom of the tank. As there are no moving parts in the liquid transfer, maintenance costs are very small.

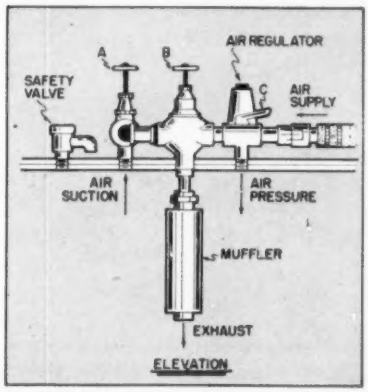
Operation of the portable disposal tank is simple. A vacuum must be created in the tank in order to cause the liquid to be drawn from the grinding machine coolant tank through the intake hose into the disposal tank. This is accomplished by first closing valve C and then opening by-pass valve B and gate valve A.

Control point of efficient discharge operation is the air regulator. The proper setting is determined by trial and will vary with the size of pipe, air pressure, nature of swarf material, and size of tank. The air regulator is used only for pressurizing the tank to force the liquid out.

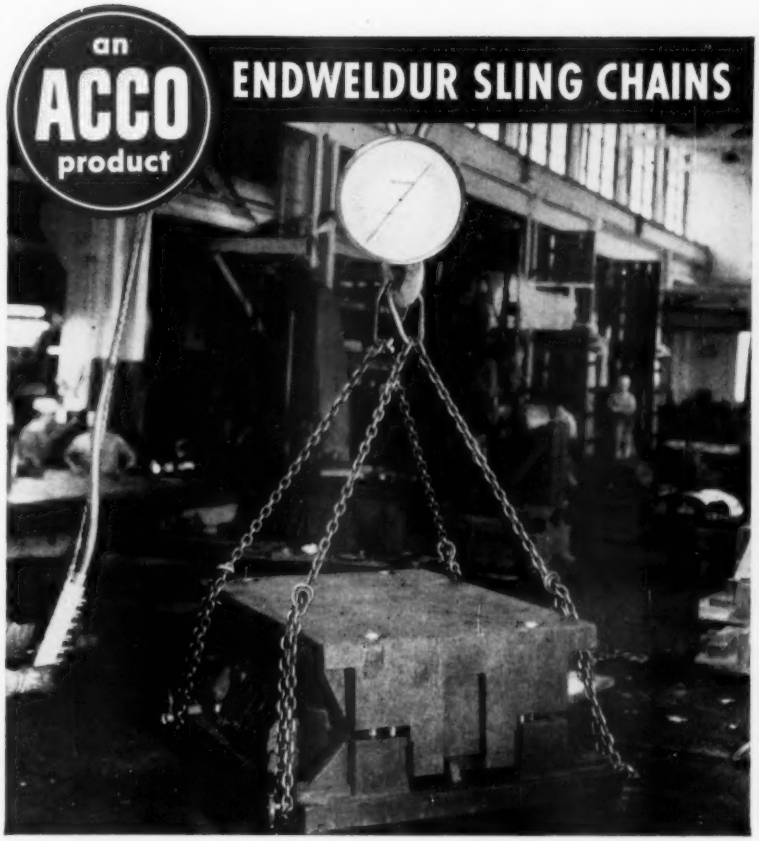
This is accomplished by closing by-pass valve B and gate valve A, and then opening valve C. The air pressure built up in the tank forces the liquid out through the discharge hose.

The disposal tank should remove all the liquid coolant and a good portion of the solid swarf deposited in the coolant tank. At this plant, 50 gal of swarf and liquid can be re-





These are views of valve arrangement for the shop-made swarf removing tank



Small AMERICAN Sling Chain Lifts 25,000-lb Load Safely

• This ACCO *Registered* 4-leg, Endweldur 125 Sling Chain is relatively light in weight yet it has sufficient strength to lift an expensive 25,000-lb die with safety.

This desirable combination of great strength and light weight is the result of scientific heat-treatment of the alloy steel used in this modern chain and the proper combination of engineered hooks and pear shaped links that make up a complete ACCO *Registered* Sling Chain assembly. This gives you a chain that is easy to handle and safe to use even where working temperatures run up to 1000°F.

Endweldur 125 ACCALLOY Sling Chains come in sizes from ¼" to 1¼" with working load limits to 57,500 lbs per leg, so there is a size for just about every lift you have. Other AMERICAN Sling Chains are available in Endweldur 85 made of carbon steel, heat-treated . . . also stainless steel, monel metal and silicon bronze . . . and wrought iron.

AMERICAN has a sling chain for your every need. See your distributor or write our York, Pa. office today for the ACCO Registered Sling Chain Catalog.

ACCO

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

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When you have a leather problem...

Consult J. E. RHOADS & SONS

At your service are Rhoads' 250 years' experience, the knowledge and expert craftsmanship of developing special industrial leathers. Whether your problem involves flat leather belting for the transmission of power . . . leather packings, or any one of a large variety of textile leather straps . . . our engineering department will help you resolve your problem.

Rhoads offers a *complete service* . . . this includes the physical testing and research facilities as well as the cooperative efforts of engineers, production men, and sales representatives. Such co-ordination of skill and knowledge, when used to survey your requirements and "custom-engineer" the manufacture of the best possible leather for your use, will result in your infinite satisfaction.

Why not put these valuable forces to work for you. To initiate the "custom-engineering" of your individual leathers, call in a Rhoads sales engineer today.

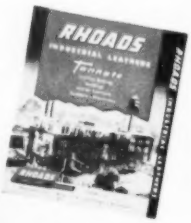
J. E. RHOADS & SONS
35 N. Sixth St., Philadelphia 6, Pa.

RHOADS "CUSTOM-MANUFACTURERS":

Tannate® LEATHER BELTING . . . with its high coefficient of friction, is tough, durable and adaptable to a variety of drive conditions.

Tannate® LEATHER PACKINGS . . . available for hydraulic or pneumatic equipment for a wide range of pressures and temperatures.

Tannate® TEXTILE LEATHERS . . . made from hides specially tanned for strapping leather, custom cut to meet your requirements.



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PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

moved from any machine in 4 min. The time required to empty the swarf removal tank is 2½ min which is equivalent to a discharge rate of 20 gpm. *From Grits and Grinds, published by Norton Company, Worcester, Massachusetts.*

Frozen Mercury Casting Process

PRECISION-WISE, the process of casting has come a long way since the Chinese and Egyptians made jewelry by the Lost Wax method nearly 4000 years ago.

Several of Thompson Products' divisions use various casting processes in producing precision parts but one of the newest and most interesting is Intricast.

Basically this process is like other methods of precision casting, but it has important advantages. They stem from the unique properties of mercury which is used as the pattern material, and from the use of improved ceramic mold materials.

Liquid mercury, because of its great fluidity will flow freely into the thinnest edges and around the sharpest angles of a die pattern.

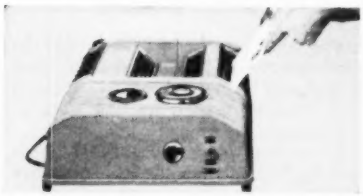
The mercury is poured into steel dies and then frozen. Since two pieces of frozen mercury will quickly weld together under very slight pressure, very complex patterns can be assembled from several simpler pieces of mercury.

This makes it possible to produce one piece, hollow castings of complex inner structure which it would be difficult or impossible to make by machining, forging and welding or by other casting processes.

Since mercury melts at -40 F, it has to be kept at -125 F in a deep

Liquid mercury comes in contact with the frozen pattern on which ceramic coatings have been formed. In this manner, the frozen mercury is reclaimed

Remington Rand Methods News



With Transcopy, one unit does the whole job – exposes, develops and prints.

Photocopies in Seconds, Made in Your Own Plant

How many dozens – or hundreds – of times have you wished you could have a copy of needed data *immediately*, without waiting for it to be typed or traced or sent to an outside service for photocopying? Now you can have photocopies in seconds, made right on your own premises, of customer orders, bills of material, drawings, etc., by either of these two methods:

One! Transcopy Duplex

A single-unit machine, Transcopy Duplex, does the complete job of exposing, developing and printing photocopies, and does it all in a matter of seconds. No darkroom needed, no running water – you can use it anywhere, move it anywhere. "Installation" is merely a matter of plugging it into any standard electrical outlet. You get perfect, ready-to-use, positive prints up to 14½ inches wide and of any length. And there's no trick to it. Anyone can learn the simple Transcopy Duplex operation in a few minutes and be an expert from there on. Interested? Just mark **(P-344)** on the coupon for free folder.

Two! Portagraph, Transcopy

If you now have a Remington Rand Portagraph or other device for exposing photocopies, there's a second Transcopy model that will team up with it to save time on the total job and eliminate messy, space-wasting developing equipment. Many users have chosen this combination of equipment because Portagraph can copy from opened booklets, pamphlets, etc., making it unnecessary to detach individual sheets. Ask for folder **P-334.**

ATT'N: PURCHASING DEPT.

Thousands of copies of Remington Rand's authoritative, fact-packed manual "Purchasing Procedures" have already been furnished to factory executives responsible for or interested in efficient procurement procedures. Would *you* like a free copy? One or more of the scores of ideas presented may be just what you've been needing to speed up paperwork routines and establish closer control. Ask for **X-1202.**

"Tailor-Made" Production Control With Firm – But Flexible – New Methods

Your production problems may very well be similar, overall or in part, to those of The Rotary Lift Company, Memphis, Tennessee. Some of their products, including hydraulic auto lifts, are reasonably standard. But most of their production consists of devices made to highly individualized customer specifications.

With all the variables encountered in manufacturing complex mechanisms on a one-of-a-kind basis, you might think it would be practically impossible to maintain a firm, effective system of production control . . . one that could assure economical coordination of manpower, machines and materials on every order going through the factory.

Complete, tabulated reports automatically prepared by this Remington Rand machine help the Rotary Lift Company control their production effectively and economically.

A workable system was found, however, in a combination of Remington Rand methods and equipment. Punched cards are utilized for high speed preparation of payrolls, and as a by-product, material and labor distribution. In addition they permit rapid, mechanical tabulation of reports valuable to Production, Purchasing Engineering, Accounting and Management executives. Facts on which to base decisions are now available in a fraction of the time previously required.

Tied right in with the Remington Rand punched-card systems are two Remington Rand visible record systems. One of these uses punched cards as inserts in Sched-U-Graph control boards for visible charting of machine loading. Job assignments and changes in schedule are made quickly, easily, with virtually no possibility of oversight or error.

Kardex, another visible system, provides for convenient recording of information supplied by punched-card Material Requisitions, and maintains an effective perpetual inventory control.

The systems flexibility you need in controlling complex, "tailor-made" production, can certainly be found in adaptations of the punched-card principle, visible record principle, or both, depending on the nature and scope of your factory operations. Remington Rand production control specialists will be glad to make specific suggestions without obligating you in any way, whenever you're ready. But in the meantime, why not read the detailed story on the Rotary Lift Company's complete, coordinated system? Mail the coupon for free copy of **CR 801.**

It's Here! A Completely Descriptive, Low-Priced Bookkeeping Machine

Now, for about one-third the price you'd have had to pay for a "big" descriptive bookkeeping machine, you can have the same, basic time and work-saving advantages. It's a simple machine, easy to operate with its touch-method keyboard, and you can use it for any kind of work – payroll, job costing, inventory, receivables, payables, general ledgers, and many special jobs. It gives you simultaneous posting of all records, complete typewriter description of entries, and complete figurework. You can get five or more totals for posting, distribution and control (up to 140 digits of totals). Ask for demonstration locally or mail coupon for free folder **AB-664.**

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PROFIT-BUILDING ***IDEAS*** FOR BUSINESS

Remington Rand

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Free literature, please, as marked below:

AB-664 CR-801 P-334
P-344 X-1202

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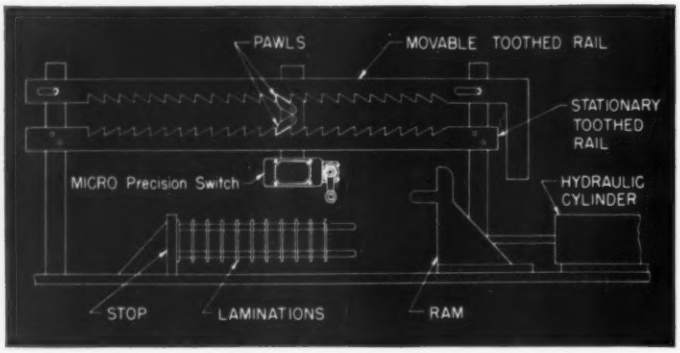
MICRO heavy duty limit switch makes accurate coil building an automatic job



• Spacing of laminations is done automatically on this coil building machine by use of a MICRO heavy duty limit switch.

1 The ram pushes laminations on tubes until contact is made with the limit switch.

2 When the switch is operated it trips a four-way solenoid valve which reverses the flow of oil in a hydraulic valve, forcing the ram to return.

3 When the ram reaches the end of its return travel, an arm on the ram causes the switch assembly to move back one notch . . . ready for the next operation.

This is another of the thousands of uses plant engineers and maintenance men are making of MICRO switches as limits, safeties and interlocks on every type of plant equipment. It is easy to make machinery safer and more productive through the use of MICRO switches. There is an authorized MICRO distributor near you with a wide variety of switches to meet your specific needs. Look in your classified telephone directory under "Switches, Electric."

MICRO A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

freeze and can be worked only in brief intervals. It must also be kept submerged in Acetone to prevent frost build-up such as one gets in one's home refrigerator.

After the pattern is finished, it goes to another deep freeze where the mold is formed around it by dipping in ceramic slurries of varying degrees of coarseness.

Once the mold build-up is complete, the mercury is melted out, and the molds are fired and set in a conveyor furnace. The resulting high temperature mold can handle any castable metal from low melting point aluminum up through bronze and steel to the high melting point cobalt and nickel-base alloys.

After cooling, the parts are broken out of the molds and given a light sand blast with very fine Zirconite sand to remove any ceramic material still adhering to them. The parts are then cut away from the gating system.

Through this distinctive process, the firm's metallurgical products division is making hollow blades, radar wave guide plumbing and other complex parts. *From the Friendly Forum, published by Thompson Products, Inc., Cleveland, O.*

Liner for Faulty Gas Line

A NUMBER of years ago, experiments were begun by some utilities on a new method of replacement of faulty gas service lines which involved the insertion of a liner inside a faulty service main. This method has now been successfully developed into an established maintenance procedure by the Public Service Electric and Gas Co. of Newark, N. J.

First, the location of offset fittings in the faulty service line is determined either from the utilities records or by probing with a rigid snake. Then, a small local excavation is made to permit cutting the service line near the main. The line is cut and the main plugged at that point.

Then, a 90-lb blast of compressed air is shot through the line. Any fittings previously located are removed. The next problem is to ream thoroughly the inside of the service pipe to its nominal diameter. This is the most important step in the entire procedure and is accomplished by using a heavy-duty tube cleaner. After the tube cleaner has been passed through the service line, it is again blown out with compressed air.

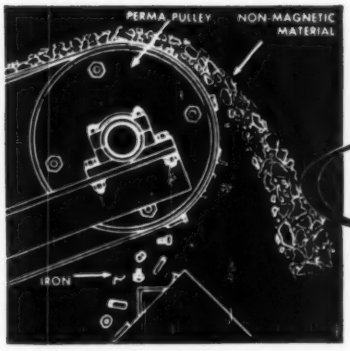
Next, a small air-driven hoist or windlass is mounted in the excavation at the end of the old gas line. A flexible cable from the hoist is

so an Ostrich can take it . . .

. . . maybe your processing equipment is a little less hardy than the proverbially tough digestive mechanism of this odd bird.

Bits of iron—nails, wire, crushed tin, nuts and bolts—are a headache, sometimes a serious hazard, to a lot of food, chemical, and other processors. Many have successfully relied on Dings Magnets to solve their problem.

Dings makes a complete line of electric and non-electric magnets for installation in, on or above material conveying systems and integration with processing machinery. They can save you plenty of trouble. Learn about them by just mailing the coupon below.



Here's Just One Way — Dings Magnetic Pulleys — both electro and Alnico permanent — are at work in all kinds of industries pulling unwanted iron out of everything from grain and cotton to coal and molybdenum ore.

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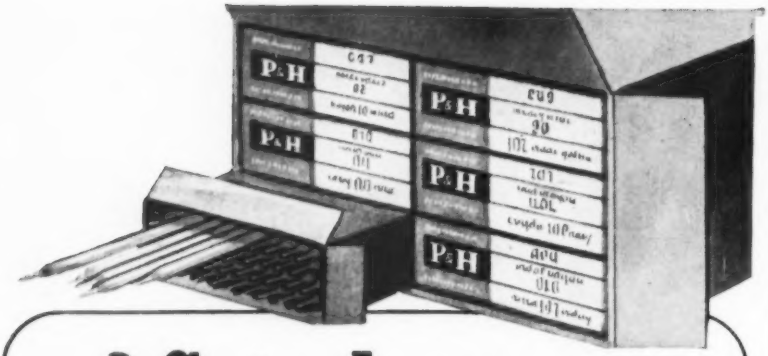

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of seldom-used electrodes

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- ★ **Harstain, 1/8"** — For spring steels and stainless steels of all kinds. AC or DC.
- ★ **Nicast "55", 1/8"** — For machinable welds on cast iron. Nicast welds are strong and non-porous.

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the P&H Line

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PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

snaked through the pipe and attached to the copper tubing insert. An ingenious, expanding gripper capable of an 1800 lb pull is then inserted in the end of the tubing, grasping it firmly.

The air hoist hauls the tube through the length of the service pipe. Service and main connections are then made using special compression fittings designed for this purpose.

After more than 2,000 renewals, this equipment and procedure has proved to be a very effective factor in reducing costs and man-hr both in normal maintenance work for long range economic results and in emergency renewals. The fact that service interruptions are cut 75 per cent by this method is also very important to the operating man and greatly improves customer relations. *From an article by I. S. Webster in Powerfax, published by Elliott Company, Jeannette, Pa.*

Airplane Parts Dunked In Giant Chemical Bath

A CHEMICAL BATHTUB big enough to dunk-like-a-doughnut the largest airframe part ever built is now in operation at Lockheed Aircraft Corporation.

This unique facility is a nine-unit metal processing tank which features the new chromodize-iridite method of preparing and cleaning aluminum prior to painting.

This is the largest chromodize-iridite facility in the aviation industry. The installation cost $165,000.

Centrally located in a special metal processing department at the main production plant, the new equipment replaces two chromodize-anodize systems that were formerly in different buildings.

It has been reported that the new iridite process, which deposits an iridescent chemical film on the part by simple immersion in chemicals, is more efficient and economical than the anodize method which oxidized the aluminum surface through electrolysis.

Use of the new system has cut time for the metal processing procedure in half. Formerly a 1½-hr operation, the entire job can now be done in 47 min. Metal parts that required up to 45 min for chemical treatment alone, under the anodize system, can now be processed in less than five minutes.

The advantages of the iridite process are as follows:

It provides a better base for paint adhesion. An iridite surface is tough and pliable, whereas anodized sur-

faces are naturally hard and brittle.

Iridite can be applied on parts having dissimilar metals, whereas anodizing requires that no metal other than aluminum be placed in the tank solution.

This system does not require special racks and racking procedures which were used to provide positive electrical contact for each individual part in the anodizing method. Part losses which resulted when poor electrical contacts caused arcing and burning of surfaces are eliminated by the iridite process.

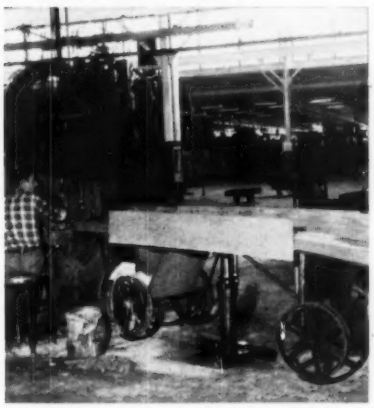
Very little maintenance cost will be required for servicing baskets used with iridite. The elimination of special racks, racking procedures and the necessity for operating two individual processing systems has already resulted in substantial man-hour savings.

Work will flow more rapidly and efficiently, to and from other departments of the plant, through utilization of the centrally located iridite system.

The following operations will be performed by individual tanks, each of which is 52 ft long, 12 ft deep and 4 ft wide: hot soap cleansing; acid etch to prepare parts for iridite. An iridite tank, one chromic acid tank for treating alclad aluminum parts, two dunk-rinse tanks, and one tank for drying, are all part of the system.

Each tank has an 18,000-gallon capacity. Special demineralization apparatus is installed which can demineralize 15,000 gal of water each day. The demineralization process removes chemicals and minerals from the water so that it becomes the equivalent of pure rain water, thereby improving the rinsing qualities. *From a release of Lockheed Aircraft Corp., Burbank, California.*

Hydraulic Lift Puts Work On the Level



Hydraulic cylinder which picks up buggy carrying steel stock enables the operator to continually adjust the level of the material so that it may be fed easily to the punch press. (Atwood Vacuum Machine Co., Rockford, Ill.)

Private FIRE Protection

is the best way to safeguard your plant

100,000-gallon Horton Watersphere provides a standby water supply for fire protection at the new International Harvester depot at Broadview, Ill.

250,000-gal. Horton suction tank provides the primary water supply for fire protection at the depot.

Private fire protection provides the best safeguard a plant can install against fires. However, according to National Fire Protection Association figures, "... private protection must be improved measurably ..."

Here's an example of what a company can do to improve its fire protection. The new International Harvester depot at Broadview, Illinois, had a 250,000-gal. Horton suction tank, a 100,000-gal. Watersphere and an automatic sprinkler system installed. The suction tank provides the primary source of water for the system and the Watersphere provides the secondary supply. The sprinkler system, installed by C. L. Doucette, Inc., of Chicago, provides a means of spraying the water on the flames the instant a fire breaks out. This type of system is ideal because it provides a depth of protection and will often pay for itself through reduced insurance premiums.

Improve the fire protection at your plant by assuring your system of an adequate, dependable water supply. Write our nearest office for estimates or quotations on a Horton suction tank, elevated water tank or a Watersphere. There is no obligation on your part.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2148 Healey Building	Los Angeles 17	1574 General Petroleum Building
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Chicago 4	2134 McCormick Building	Pittsburgh 19	3243 Alcoa Building
Cleveland 15	2258 Midland Building	San Francisco 4	1582-200 Bush Street
Detroit 26	1569 Lafayette Building	Seattle 1	1370 Henry Building
Houston 2	2166 C & I Life Building	Tulsa 3	1669 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Carbide Sharpening Hints

FOUR STEPS to sharpening carbide tipped masonry drills have been outlined by the Carboloy Department of the General Electric Co.

Use of silicon carbide wheels is recommended for sharpening the drills and restoring the 118 deg included angle to the tip. The drills should be sharpened when the cutting edge develops a minimum flat of 1/64 in.

The steps, as indicated in the outline, are:

A. Place one cutting edge of the drill against the side of the grinding wheel at a 20 deg angle to the vertical, to maintain the required clearance angle in the tip. At the same time, the drill should be angled with respect to the wheel axis, to maintain the desired included angle.

B. Using moderate pressure, move the drill back and forth across the wheel, to avoid overheating. Should overheating occur, do not put the drill into coolant.

C. Keep the two cutting edges of the drill of equal length.

D. Repeated sharpening of the drill will reduce the clearance between the carbide tip and the steel shank. As this clearance diminishes, grind away the steel from behind the carbide tip to maintain at least 1/32 in. clearance between the shank and the carbide working surface.

Carbide tipped drills can be sharpened on either a pedestal or bench type grinder, or if necessay, a portable drill motor can be mounted on a stand to power a small silicon carbide wheel.

Moth Balls Protect Silver Plate

TO KEEP silver-plated component parts of coaxial tuners, used on VHF two-way radio receiver chassis, free from tarnish and fungus, Motorola, Inc., Chicago, packs the parts in standard home-variety paradichlorobenzene moth balls.

Unless protected, the heavily silver-plated parts tarnish quickly upon exposure to industrial atmosphere where the air contains a high percentage of the products of the combustion of sulphur bearing fuels. This tarnish, as well as any protective lacquer coatings interfere with an assembly soldering operation performed by a special induction heater soldering unit.

During the pre-assembly period parts are stored in the protective vapor. At the time of assembly the parts together with the moth balls are transferred to a pick box at the operator's position.

The necessity of replating the parts for appearance is eliminated by keeping them within the vapor of the moth balls until after all soldering processes are completed. Then protective lacquer is applied.

Operator picks silver-plated tuner part from moth ball protected stock box

Versatile Low-Volume Pump

Contributed by Tom M. Gayle

ALTHOUGH PRIMARILY intended for automotive and marine use, electric fuel pumps can be adapted to many industrial uses requiring light, portable, low volume pumping units.

Construction of the units is of

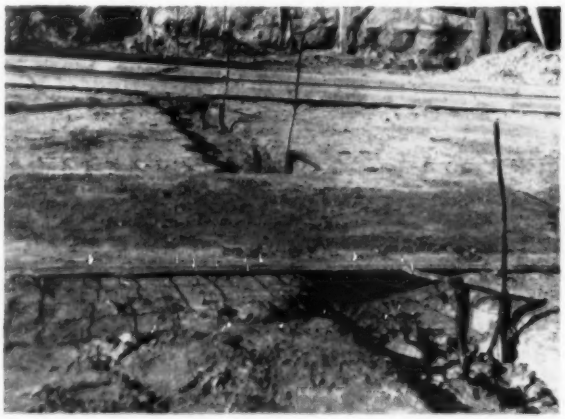
Reinforcing Mesh Wired to Heat Traffic Lanes in Truck Ramp, Keep Them Clear of Ice and Snow

Contributed by R. W. Caldwell, Dow Corning Corp.

REINFORCING MESH was used as the heating element in the ice-free truck ramp at Dow Corning's plant in Midland, Michigan. Sidewalk-size mesh, 2 ft wide, was laid in the concrete, also under the truck lanes backing into the dock. Copper connectors welded into the mesh provided the link between the mesh and the low voltage transformers that supplied the current. The resistance is set so that only moderate heat is imparted to the concrete.

Experience has shown that when a thin layer of ice is present on the ramp, 15 to 20 minutes of heating time will melt the ice sufficiently to allow safe trucking on the ramp.

Cables imbedded under concrete ramp supply current to wire mesh heating element and melt thin layer of ice in 20 minutes

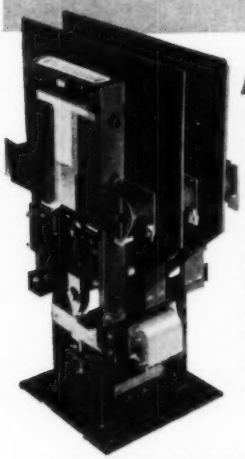


View across truck ramp during construction shows several of the cable endings that were used for mesh connections

which contactor meets your needs

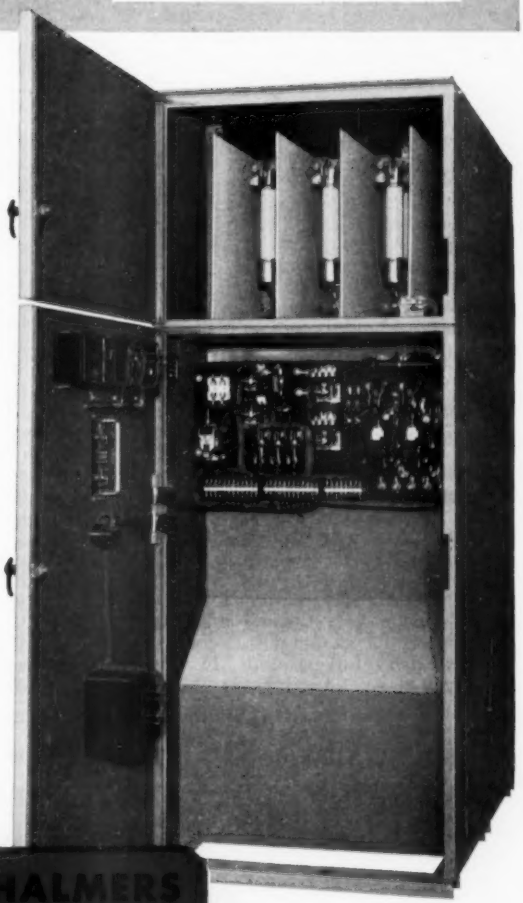
AIR or OIL?

Either may be built into your Allis-Chalmers Type H starter along with meters, overload relays, current limiting fuses, auxiliary switches . . . the coordinated components dictated by your application for complete protection of man, motor and machine.



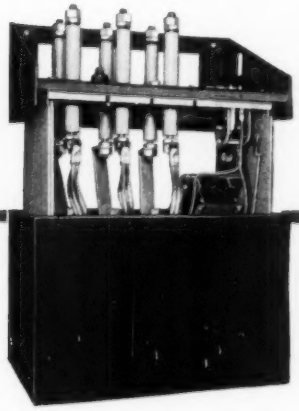
AIR-BREAK CONTACTOR

When the going's rough . . . that's the place for the Type 256 air-break contactor. Frequent starting, inching, reversing or dynamic braking are taken in stride by this rugged performer. And, of course, fire hazard is greatly reduced. No turning shafts, shaft bearings and flexible leads to cause maintenance headaches. Double-break contacts, vertical action and dual blowouts provide long, trouble-free operation.



OIL-IMMERSED CONTACTOR

Got atmospheric troubles? The Type MO oil-immersed contactor will perform heavy duty starting service in dust-laden, corrosive and very moist atmospheres. Contactor is of the time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Make and break arcing occurs only on tips. Self-aligning E type magnet provides perfect armature seating . . . long, quiet operation. Permanent windlass tank-lifter simplifies maintenance. A-4103



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Type H Starters

FOR 2300 TO 5000 VOLT MOTORS

Call Your Nearby A-C Representative or Write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

ALLIS-CHALMERS

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OPERATION & PRODUCTION

(O and P begins on page 48)

reciprocating displacement type with solenoid actuation, usually incorporating a built-in switch which energizes the solenoid in accordance with output pressure.

Maximum capacity is normally about 10 gph against a few pounds pressure. When greater capacity or discharge pressure is desired, pumps may be operated in parallel or tandem.

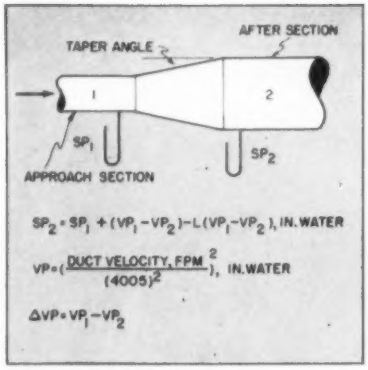
Designed for 6 or 12 volt d-c service, a unit operating from a small 6 volt dry battery is a truly portable pumping unit, with no need for external power connection.

Possible applications include sump pumping, lubricant feed to machinery, continuous sampling from streams or manholes, addition of non-corrosive chemicals and inhibitors to flowing streams and fuel feed to engines and burners.

Static Regain in Ducts

Contributed by John D. Constance

WHEN A DUCT diverges, its cross-sectional area increases and the velocity through it decreases. Consequently there will be a conversion of velocity head into static head, which is known as "static regain." This regain is possible only if the divergence is not so rapid that the air will lose its contact with the walls of the diverging section. If this happens, most of the kinetic energy of the air stream will be consumed by eddies and little if any static regain is possible.



Velocity-pressure formulae, with typical transition arrangement in air duct

As the taper angle (½ total included angle) of the transition increases, the air loses contact with the walls of the transition and the losses increase hand-in-hand with a decrease in static regain. For the commonly used angle of taper of 7½ deg (slope 1 to 6) the fraction of the difference in velocity pressures (△VP) is only 0.64.

Losses due to friction within the transition must be accounted for. As the taper angle grows smaller the length of transition or flare becomes longer with increase in friction for the transition. The critical taper angle has been found to be 5 deg. Also, the after-section may advantageously be made to have a cross-sectional area equal to four or more times that of the approach section and regain could be made to approach 100 per cent. However, friction with these smaller taper angles nullifies a large proportion of the theoretical regain of energy.

When used as a part of a duct within a system the static regain would be limited by the cross-sectional area of the downstream connecting duct. However, when placed after the discharge of a fan exhausting to atmosphere the cross-sectional area of the after-section may be made to realize the maximum advantage of static regain. This regained static head helps to drive the air against the resistance of the duct system so that the larger the regain the less static head has to be provided by the fan. A loss of regain is a definite loss of head, which must be compensated by the fan in developing a larger static pressure. The static pressure at the end of the transition and before the after-section is given by formula as shown in the accompanying sketch.

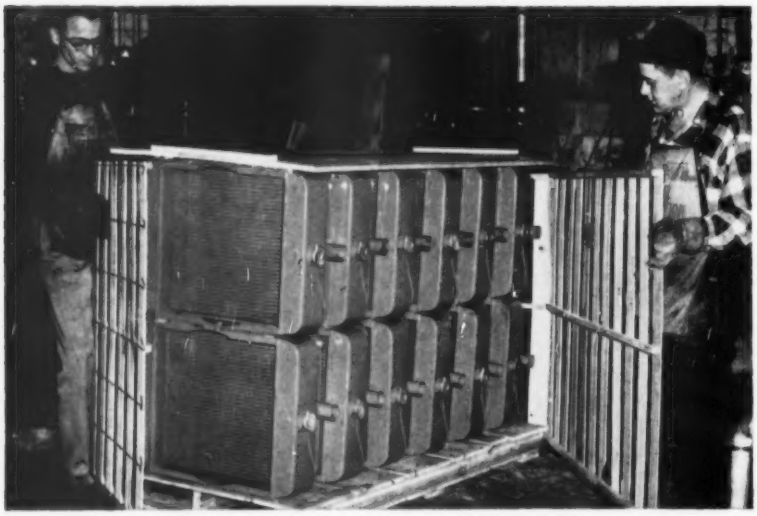
The addition of an after-section to transition was found to increase the effectiveness of static regain. With a total included angle of 3 degrees at the conversion such an after-section, however, does not materially increase its effectiveness. Usually in practice a 3-deg expanding section is so cumbersome that it is substituted by a 15-deg total angle transition for installation in close quarters.

Sealing Storage Battery Cells

STORAGE BATTERY cell covers are sometimes removed for internal inspection and repairs. In reassembling the cell unit, it is essential that a proper seal be obtained between the cover and the jar. Gould-National Batteries, Inc. offers these eight tips to good results: 1. Use the right compound; in most cases bat-

(Continued on page 52)

Multiple Unit Packaging Cuts Handling Costs, Permits Direct Delivery to Assembly Lines

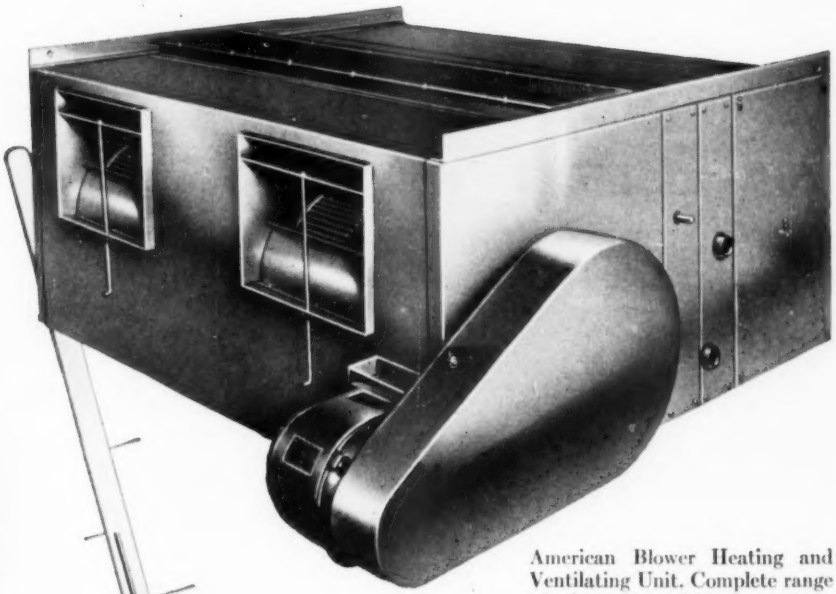


Packers complete unit pallet load by installing "wrap-around" crate sides on load

MULTIPLE UNIT packaging of items destined for assembly lines in other plants is effecting considerable savings in packaging operations at McCord Corp., manufacturers of truck and tractor radiators, Plymouth, Indiana. By switching from heavy nailed cartons holding 4 radiators to a palletized crate holding up to 24, McCord was able to cut the preparation time of an average shipment of 96 radiators from 30 hours to 4 hours. The palletized crate, designed by General Box Co.'s Industrial Packaging Laboratories, also reduced the shipping weight of 24 radiators from 1320 lb to 962 lb, at a 25 per cent savings in freight costs. Seventeen different styles and sizes of radiators can be handled in the same crate.

In the receiver's plant, the radiators can be moved by fork truck directly to the final assembly point in the original shipping container and unpacked on the spot.

American Blower *Heating and Ventilating Units*



American Blower Heating and Ventilating Unit. Complete range of sizes. Capacities from 1000 to 33,000 cfm and 45,000 to 2,500,000 BTU/hr.

That delightfully fresh, pleasant atmosphere which works wonders for employee morale, working and selling conditions, is assured when American Blower Heating and Ventilating Units are installed.

These dependable units, with slow-speed centrifugal fans, are available in a wide range of sizes for wall, horizontal, inverted and floor installation. Each fan housing is equipped with Aileron control. Humidifiers, face and by-pass dampers, filter boxes and mixing boxes are available.

Investigate these efficient Heating and Ventilating Units *now*. Call your nearest American Blower Branch Office for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER
YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

For more facts circle 537 on Reply Card

STOP Irritating Production Delays

Latest Improved Dual-Element Fuse

JEFFERSON SAF-T-LAG FUSES

Sure Protection

No Unnecessary Shutdowns

Long Time Lag

JEFFERSON ELECTRIC

How To Select Fuses For Proper Motor Protection

• Jefferson provides a complete chart for proper fuse selection, 1.3 amps. to 600 amps., — for single and three phase motors, all standard voltages — for "Ordinary" service and "Heavy" service. Write for Folder 482-ST.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

PIONEER MANUFACTURERS OF FUSES OF ALL TYPES, RENEWABLE AND NON-RENEWABLE. SOLD THROUGH ELECTRICAL WHOLESALERS EVERYWHERE.

For more facts circle 538 on Reply Card

OPERATION & PRODUCTION

(O and P begins on page 48)

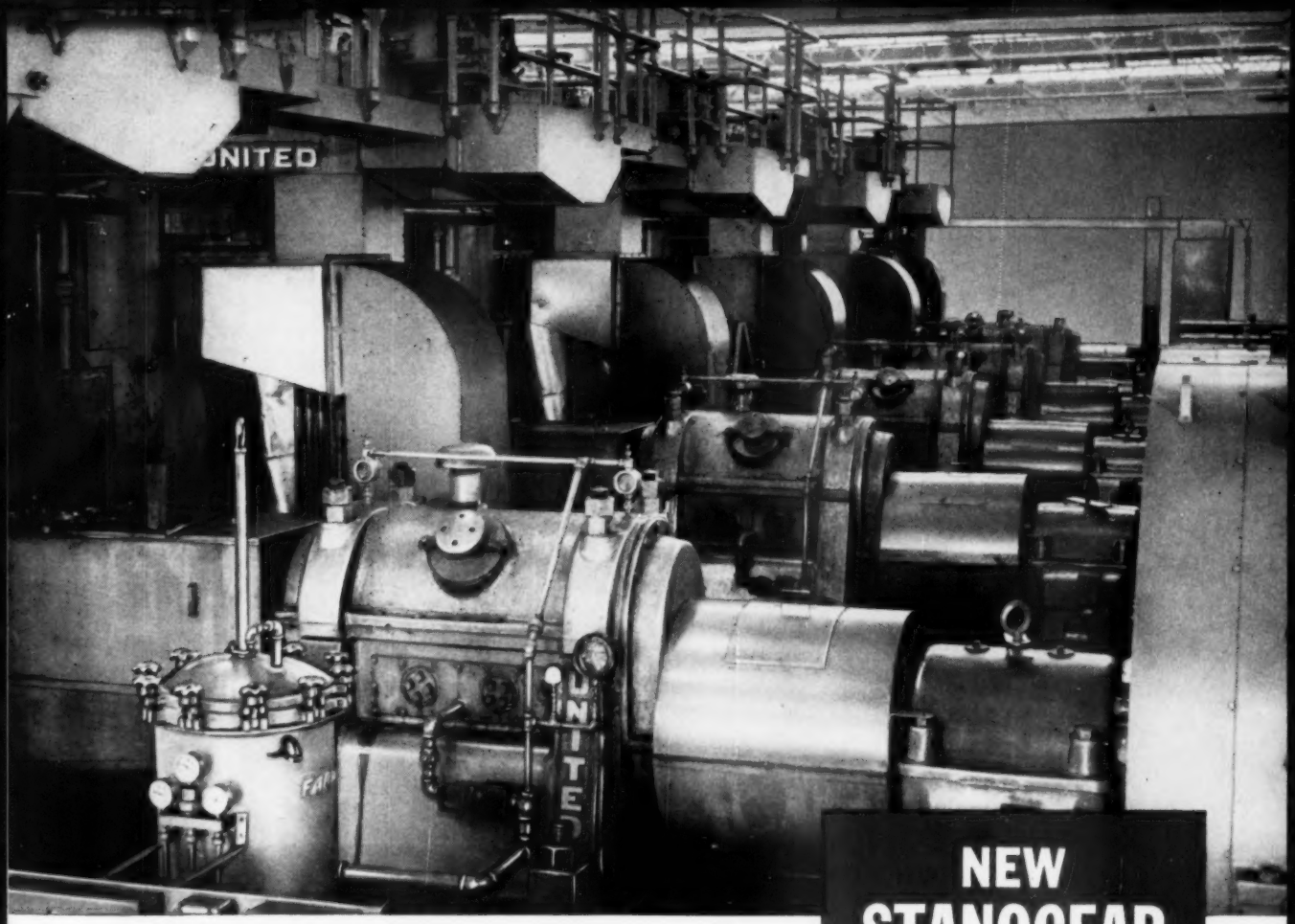
tery makers will supply sealing compound packaged ready for use. 2. Any convenient source of heat may be used such as a gas burner, electric hot plate or blow torch. Do not raise the temperature of the compound unduly high. 3. Do not permit the compound to burst into flames. Burning consumes the oil in the compound, and loss of oil impairs its effectiveness. Too rapid heating and too high temperatures cause the compound to catch on fire. 4. Almost any metal container may be used to melt the compound. The melting pot should have a good pouring lip to minimize spilling during pouring. 5. If some compound remains after pouring a seal, it may be cooled, stored and reused. However, when the compound is being reheated, do not puncture the unmelted top layer because pressure in the lower section of melted compound may cause hot, melted compound to squirt up through the hole, endangering nearby personnel. 6. Clean the surfaces to be sealed, neutralize with ammonia or baking soda and dry all surfaces carefully. 7. Be sure the cover is properly seated on top of the cell and is level with other cell covers in the battery. 8. Pour the sealing compound into space between the cover and the jar carefully to avoid spilling. Avoid forming recesses where acid spray can collect. Smooth over rough spots and remove excess compound after the compound has solidified.

Boom Gets The Man to the Job

Access to the work is often a major consideration in servicing ceiling-hung fixtures and in-plant equipment. Cleaning and changing lighting, checking overhead heaters, painting, repairs to piping, and changes or installations of service lines can be difficult operations, at heights.

The St. Clair plant of Euclid Road Machinery Co., Cleveland, had these problems, complicated by a ceiling height of 40 ft. Large machinery on the floor made it very difficult to use ladders safely, and scaffolding was costly and inefficient. Safety requirements and maintenance needs indicated that a mobile unit with easily controlled elevating mechanism would solve the problem.

Now in use in the plant is an aerial tower, manufactured by Mobile Aerial Towers, Inc., mounted on a Towmotor truck. It consists of an hydraulically operated extensible tower with full control from the operator's platform (at the point of the boom) for moving up, down or laterally as the operator desires.



NOW . . . 7 ways better for extreme-pressure lubrication . . .

New and improved STANOGEAR Compounds have been developed to meet the requirements of an increasing variety of tougher extreme-pressure lubricating jobs found throughout industry, today. The result of several years of special research and field test work, these outstanding products have proved in actual service their ability to provide these important advantages:

1. Higher load carrying capacity. Use of improved extreme-pressure additives in STANOGEAR Compounds provide a greater anti-weld property. This results in the higher load carrying capacity which these products have demonstrated in actual service.

2. Superior retention of load carrying capacity. In service tests, STANOGEAR Compounds have proved superior to conventional extreme-pressure lubricants in ability to maintain a high load carrying capacity over extended periods of service.

3. Freedom from objectionable deposits. Appropriate base stocks and additives give STANOGEAR Compounds a high resistance to oxidation, thus minimize the formation of deposits.

4. Excellent storage stability. STANOGEAR Compounds contain compounding ingredients which assure excellent stability both in service and storage.

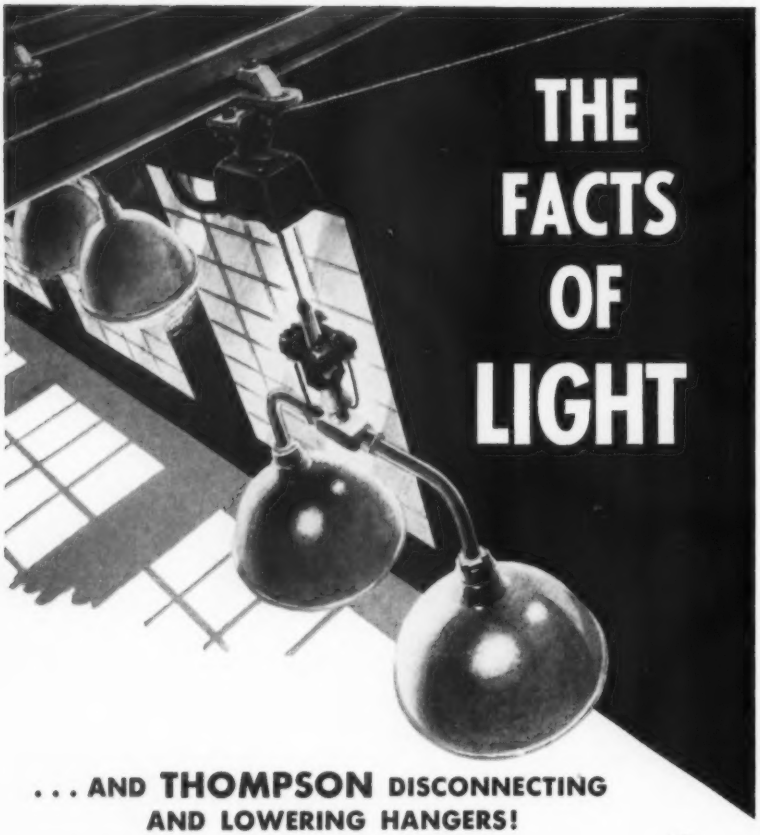
5. Good water separation. STANOGEAR Compounds have demonstrated their superiority to ordinary extreme-pressure lubricants in ability to provide good water separation.

6. Anti-foaming. Under adverse operating conditions, the anti-foam agent in STANOGEAR Compounds has prevented foaming troubles.

7. Versatility. A unique combination of additives in STANOGEAR Compounds equips these products for various industrial gear applications where extreme-pressure lubricating properties are necessary. To meet varying viscosity requirements, STANOGEAR Compounds are available in eight viscosity grades.

The Standard lubrication specialist in your area of the Midwest will be glad to give you more information about the new STANOGEAR Compounds. You need only phone your local Standard Oil office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois

STANDARD OIL COMPANY STANDARD *(Indiana)*



. . . AND THOMPSON DISCONNECTING AND LOWERING HANGERS!

FACT NO. 1: Around-the-clock plant efficiency requires regular planned maintenance of lighting equipment.

FACT NO. 2: Only high-bay lights suspended from Thompson disconnecting and lowering hangers can be serviced easily and safely . . . at floor level.

FACT NO. 3: Plants equipped with Thompson hangers are setting records in safety. No ladders, scaffolding or hazardous practices are needed for luminaire maintenance . . . one man quickly cleans and relamps lowered fixture while standing on the floor. Electrical dangers are eliminated by Thompson hangers because lowered fixtures are "dead".

FACT NO. 4: Thompson disconnecting and lowering hangers cut maintenance costs by saving man hours . . . reducing accidents. One man can clean four times as many Thompson hanger-equipped lights per hour as two men servicing fixed-position lights by means of ladders or scaffolds.

To learn the complete facts of light, write today for the new illustrated BULLETIN TH-52.

130H-TE

1. DISCONNECT 2. LOWER 3. SERVICE 4. REPOSITION 5. REPEAT

THE THOMPSON ELECTRIC CO.

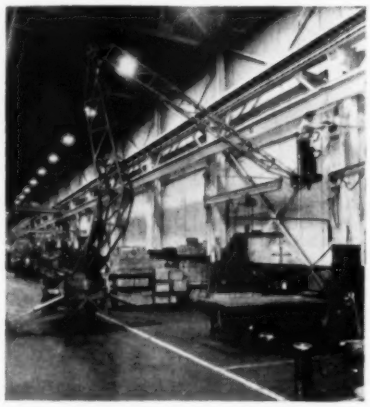
1165 POWER AVENUE • CLEVELAND 14, OHIO

For more facts circle 540 on Reply Card

OPERATION & PRODUCTION

(O and P begins on page 48)

Truck and boom unit with boom folded in place for travel through the plant



With outriggers supporting the unit, boom holds operator at working height

After positioning the unit in a convenient aisle space, the operator steps to the platform and moves the folded boom to working position. Top working position of the platform base is 43 ft above the floor; maximum horizontal reach is 30 ft; and the platform may be spotted anywhere in these ranges within a 280 deg turntable rotation.

"Shortened" Lift Truck

WITH ITS most economical load unit demanding a 4000-lb capacity platform truck for handling, and the truck specifications demanding a platform length of at least 72 in. with an overall truck length of 137 in., the Wm. Wrigley Co., Chicago, had a problem. Because the depth of its freight elevator was 17 in. less than the length of the truck, a method had to be developed to get the truck into the elevator.

Collaboration with the engineers of the Elwell-Parker Co. resulted in modification of a standard truck

"Poor Ted! No more splinters for the nurse to pull out since we have bench tops of

MASONITE TEMPERED PRESDWOOD"

all through the plant...

MASONITE PRESDWOOD

solves maintenance problems!

It's a fact! Bench tops, table tops and other work surfaces of Masonite Tempered Presdwood are safer! No slivers, no splinters, no jagged edges!

This grainless, all-wood hardboard presents other advantages, too. Its flat, smooth surface won't injure even highly polished parts. It takes a lot of punishment. And it comes in types and thicknesses for practically every need.

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City.....*Zone*.....

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• NO JERKING, slip-clutching or racing engines!
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608 SOUTH DEARBORN STREET · CHICAGO 5, ILLINOIS
* PATENTED
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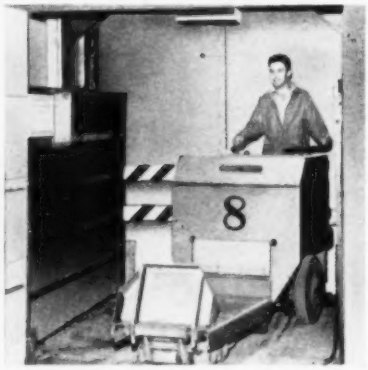
OPERATION & PRODUCTION

(O and P begins on page 48)



Hinged portion of truck platform folds back to permit entry into elevator

platform to fit the elevator, yet carry the load required.

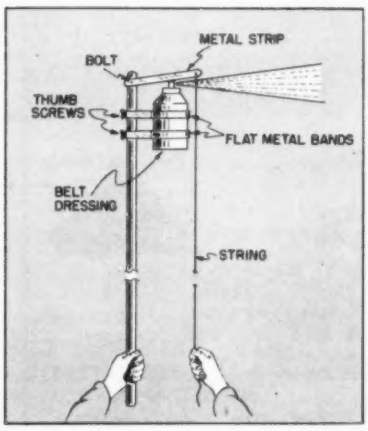
The front end of the platform was hinged, with a 17-in. section arranged to fold back over the platform. And, for greater length reduction, the truck operator's pedals on the rear of the truck were hinged.

Total length of the truck, as modified, is 118 in., which permits its entry into the elevator.

Belt Dressing Sprayed On Overhead Belts

A SAFE METHOD for applying belt dressing to overhead and otherwise inaccessible belts permits servicing these belts while they are running, with no danger to the operator.

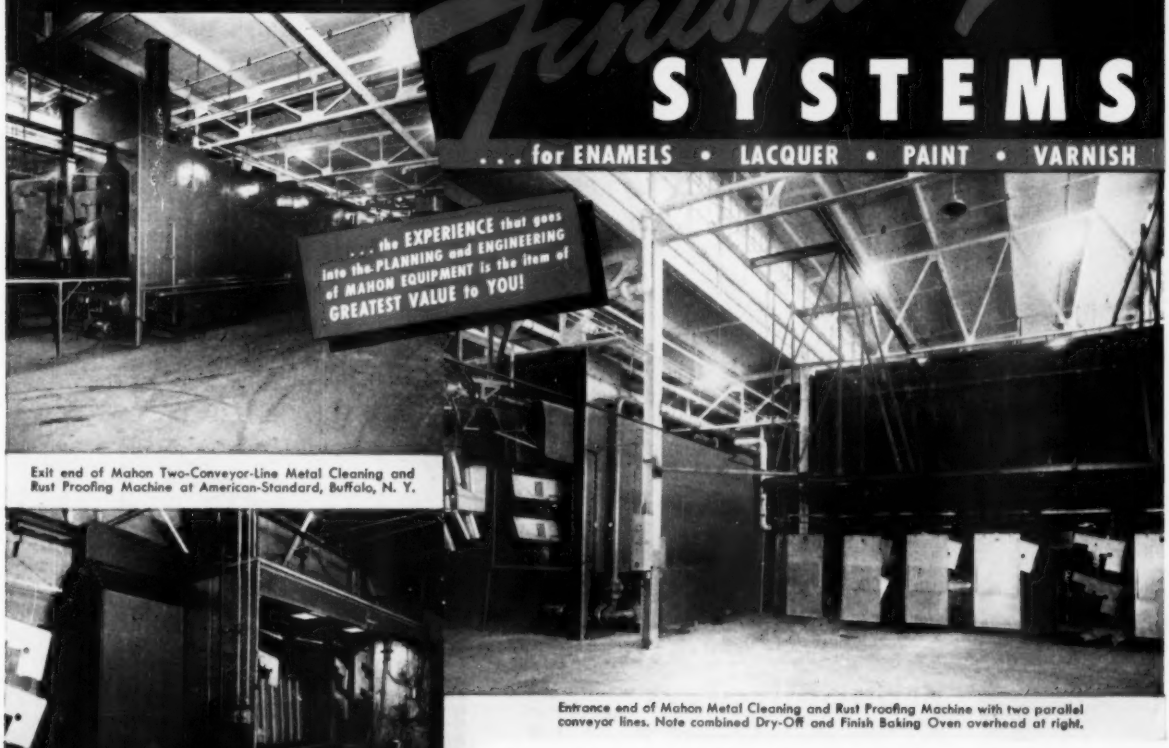
Using Sprazon dressing, packaged in a pressurized can by Graton & Knight Co., the can is attached to a pole with metal straps. A metal strip, pivoted at the pole top, rests on a rivet directly over the can valve. A string pulled by the opera-



Pull on string opens valve of belt dressing container clamped to pole

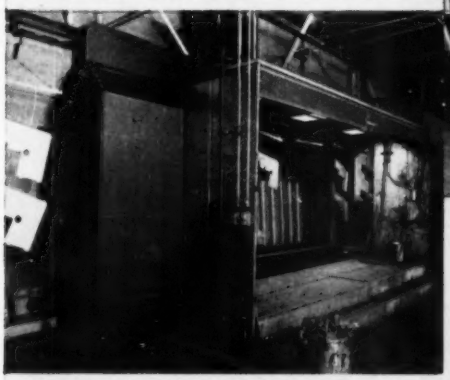
COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH

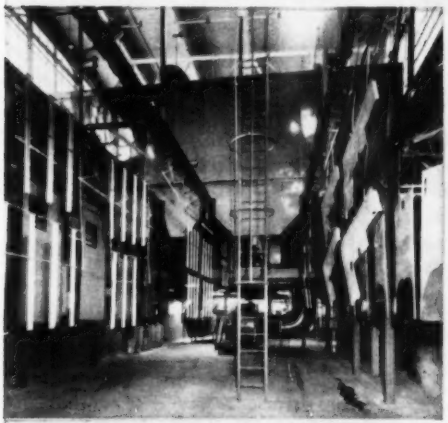


Exit end of Mahon Two-Conveyor-Line Metal Cleaning and Rust Proofing Machine at American-Standard, Buffalo, N. Y.

Entrance end of Mahon Metal Cleaning and Rust Proofing Machine with two parallel conveyor lines. Note combined Dry-Off and Finish Baking Oven overhead at right.



One of four Mahon Conventional Type Hydro-Filter Spray Booths with "Hydaire" Flood Sheet—part of the Complete Mahon Finishing System at American-Standard.



Mahon Overhead, Bottom Entrance, Combined Dry-Off and Finish Baking Oven at American-Standard. Dry-Off section is at the right. Temperature Control is Automatic.

American-Standard Products Receive Their Fine Finish in Mahon Equipment!

Illustrated here are major elements of one of two Complete Finishing Systems recently installed by Mahon in the Buffalo Stamping Plant of American-Standard. In this particular system, which is ultramodern in every respect, jackets and other metal parts of residential heating and cooling units are carried through the entire system on two parallel conveyor lines. Metal Cleaning and Rust Proofing is accomplished on the two conveyor lines in a single processing tunnel. The two parallel conveyor lines then carry parts through an overhead bottom entrance, single-pass Dry-Off Oven which is an integral part of the Finish Baking Oven. Parts on each of the conveyor lines then pass through two conventional type Hydro-Filter Spray Booths, staggered right and left hand, where the finish is applied. Finish is baked while the two parallel conveyors make a double pass circuit in the finish baking section of the overhead oven. This is a typical Mahon engineered Finishing System. If you are contemplating new finishing equipment, you too, will find that Mahon engineers are better qualified to do the all-important planning and engineering which is the key to fine finishes at minimum cost . . . and you will also find Mahon equipment more economical to operate over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File for further information, or write for Catalog A-653.

THE R. C. MAHON COMPANY

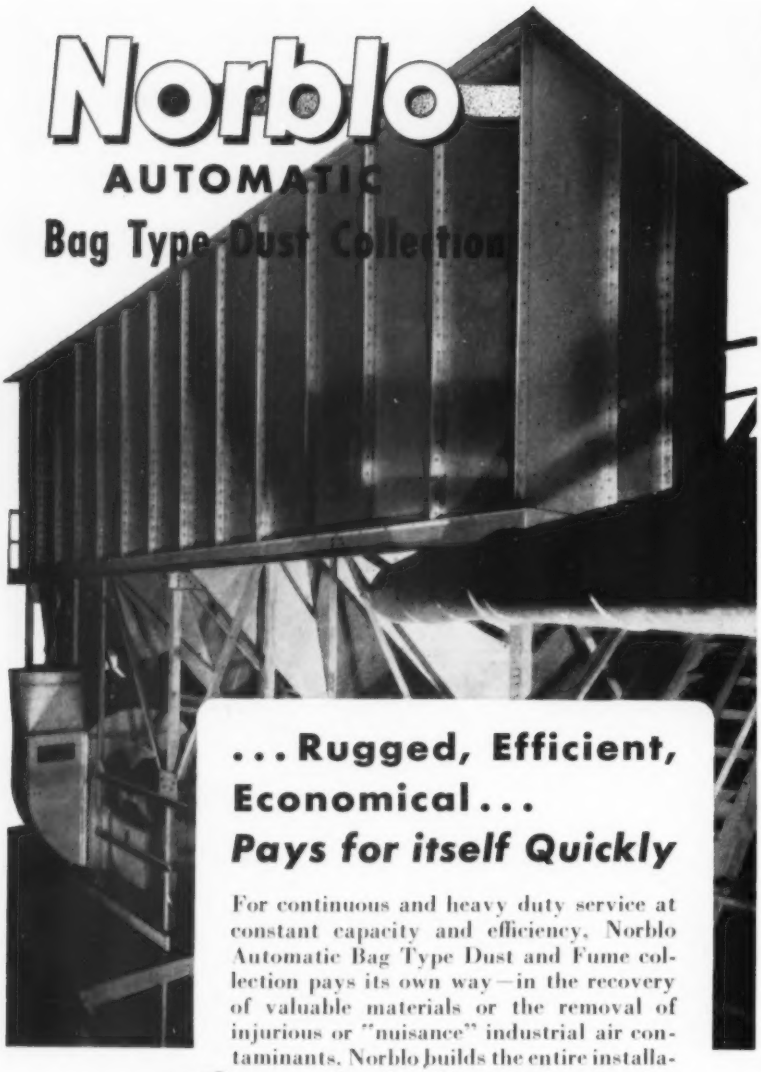
HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

MAHON

For more facts circle 543 on Reply Card

Norblo
AUTOMATIC
Bag Type Dust Collection



...Rugged, Efficient, Economical...
Pays for itself Quickly

For continuous and heavy duty service at constant capacity and efficiency, Norblo Automatic Bag Type Dust and Fume collection pays its own way—in the recovery of valuable materials or the removal of injurious or "nuisance" industrial air contaminants. Norblo builds the entire installation, from blowers to bag-cleaning mechanisms. Complete systems are engineered to meet specific situations, production layouts and required capacities. Norblo engineering insures low maintenance and no shut-downs—guarantees performance of every installation. Write for Bulletin 164-3.

Norblo also builds centrifugal and hydraulic dust collectors, exhaust fans, cement air cooling systems and portable dust collectors.

Cutaway shows Norblo basic unit of 78 bags. Automatic shaking and bag cleaning, one unit at a time, insures full use of cloth area better than 99% of the time.

The Northern Blower Company
Engineered Dust Collection Systems for All Industries
6423 Barberton Ave. Cleveland 2, Ohio

For more facts circle 544 on Reply Card

OPERATION & PRODUCTION

(O and P begins on page 48)

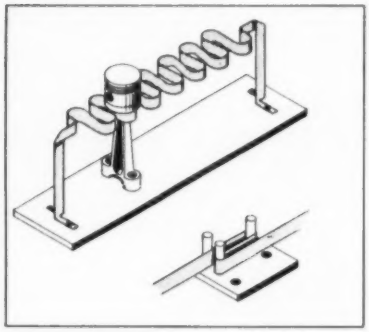
tor releases the spray of belt dressing, easily directed onto belt and pulley surfaces.

In addition to its safety features, the use of the method requires no ladders, saves time, and keeps belts properly serviced.

Handy Rack for Small Parts

Contributed by C. H. Willey

A LENGTH of 1¼ by ⅛ in. flat stock can be formed into a rather ingenious parts rack, by employing a wooden hole-and-peg jig. The cold



Parts rack formed from flat stock by bending around pegs in wooden jig.

rolled steel forms relatively easily, and the pegs are moved from hole to hole as the rack takes shape. The completed rack can be attached to a suitable base, or workbench.

Dip Cleaning of Dimpling Dies

DIMPLE DIE CLEANING has been shortened from an 8-hour-a-week undertaking to a 10-minute job at Temco Aircraft Corp., Dallas. Abrasives had been used to grind aluminum burrs, burned grease and paint off chromed die faces. Some of this foreign material melts in the heat associated with dimpling operations, and the melted and burred matter cakes around the base of the die cone, to ruin die configuration and usually cause marred and misshapen dimples.

Grinding cleaned off the melted matter satisfactorily, though slowly, but abrasives often increased the damage to die configuration.

Now, Temco uses a solution of caustic soda and water, at a cup-to-a-gallon ratio, heated to 200 F. Dirty dies are dropped into the mixture, and 2 to 10 minutes later taken out. Rinsed in plain water and dried, the dies look and perform as good as new.

The inexpensive solution won't

damage the metals of which the dies are made; in fact dirty dies may be soaked in the solution overnight or indefinitely, without damage.

Conveyors Ease Mold Handling

COMPARISON of the "before" and "after" conditions in the foundry of a Chase Brass & Copper division, points out the advantages of conveyorizing molding operations.

Prior to the conveyor installation, as molds were made, they were placed in pouring position along floor-mounted channels. When ready for shakeout they were lifted onto hand trucks and pushed to the shakeout stand. Both operations required manual handling; skilled molders' time was wasted.

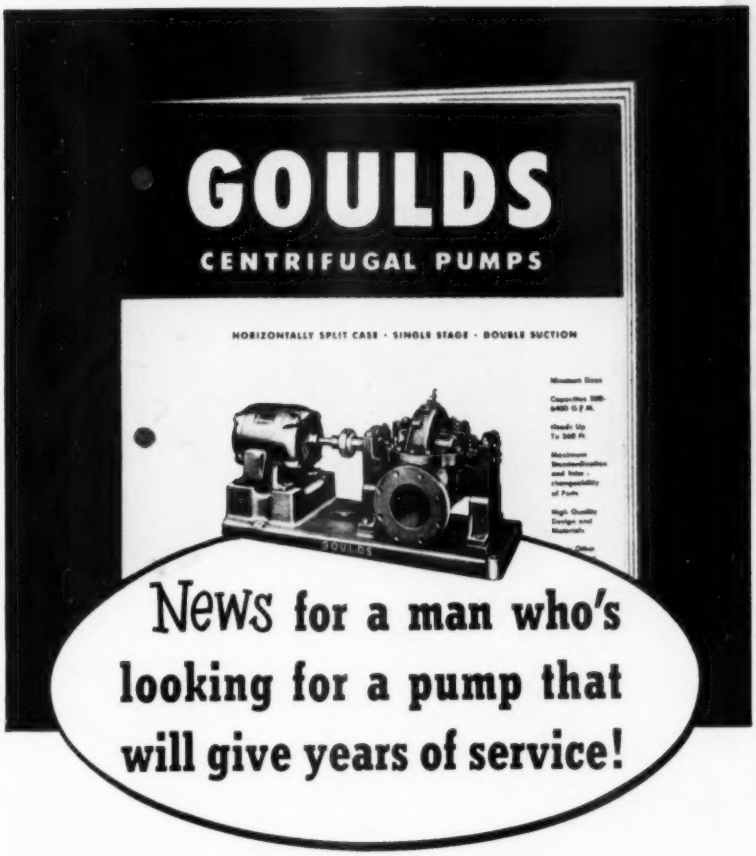
With the conveyors installed, completed molds are conveyed to pouring location on one of two roller conveyors which flank each molding station. When a conveyor is full, the molds are poured off. After cooling, the molds are pushed back along the conveyor to shakeout stations behind the molder, where a helper performs shakeout operation.

A belt conveyor takes sand to the sand bin for reuse, and an overhead monorail conveyor carries gates to the cleaning room. Virtually all manual handling is eliminated.

Photos: Gifford-Wood Co.

Molds lined up on floor for pouring

Molds are poured on roller conveyor


GOULDS
CENTRIFUGAL PUMPS
HORIZONTALLY SPLIT CASE · SINGLE STAGE · DOUBLE SUCTION
News for a man who's looking for a pump that will give years of service!

For fifty years we've been learning from our industrial customers what they want in centrifugal pumps.

We've come as close as modern design and materials allow to putting what you've taught us into our new Fig. 3405 pump.

The quality of materials and extras of design that you have been able to get only by paying *extra* are *standard* on this pump: stuffing box bushings, bearing housings sealed against moisture and dirt, stainless steel impeller keys, Teflon water seal rings—just to mention a few.

The Fig. 3405 carries interchangeability of parts far beyond anything we've been able to do before. Only three shaft and impeller assemblies provide for 19 pump sizes, or 38 pump combinations, counting right- and left-hand rotation.

This can mean real spare parts inventory savings for any plant that uses many pumps. It also means easy-to-make field changes to meet new requirements.

You'll find a lot to interest you that we can't tell you about here in the 12-page illustrated bulletin on our new Fig. 3405 pump. We think you'll agree that here's a pump with everything for long, satisfactory service.

Just fill in the coupon to get a copy of the bulletin, pin it to your letterhead and mail it to us at your convenience.

Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC.
Dept. PL, Seneca Falls, N. Y.
Please send me Bulletin No. 721.6 describing the new Fig. 3405 centrifugal pump.

Name_____

Company_____

Address_____

City_____ State_____

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Mounts Right in the Air Duct—

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COURT DECISIONS — a summary of legal findings for the plant engineer

Prepared by Albert Woodruff Gray

Explosion On Adjacent Premises

A fire policy covering a building and its contents contained the clause, "This company shall not be liable for loss caused directly or indirectly by invasion, insurrection, riot or (unless fire ensues and in that event, for the damage by fire only) by explosion of any kind or lightning."

An adjacent building burned as the result of an explosion and the assured sued to recover the damages incurred from the flaming pieces of roofing paper with the attendant soot and grime from the adjoining building that settled over the building and its contents covered by this policy.

The insurance company maintained that no fire had occurred on the premises insured and that any loss or damage the building or its contents may have suffered, was not within the coverage of this policy.

The trial court held that no liability rested on the insurance company for the loss. Affirming that judgment the Missouri appellate court said,

"So far as we have been able to discover it has been universally held that such a policy does not make the insurer liable for losses occasioned merely by concussion from an explosion which occurs in another building although the explosion was caused by an antecedent fire."

Loss or Damage In Transit

An order for terra cotta pipe was recently placed by a Maryland firm with the stipulation, "Delivery of the goods to be made to a railroad carrier for the purpose of transmission to the buyer, f.o.b. cars, freight prepaid to point of destination, Perryville, Maryland."

The merchandise was shipped and in transit a small portion of the pipe was broken. The buyer deducted $90.12 from the invoice, claiming that this breakage had occurred before delivery.

Suit by the manufacturer was brought for this balance and in its recent decision the District of Columbia court held that this loss was the seller's, not the buyer's. "We start with the old and familiar propositions that loss or damage in transit usually follows the title and that where the contract requires delivery at point of destination title usually remains in the shipper and the risks of transportation must be borne by him."

The Uniform Sales Act, which has been adopted by thirty four of the states and in the other states is judicially established by the courts, is,

"If the contract to sell requires the seller to deliver the goods to the buyer or at a particular place or to pay the freight or cost of transportation to the buyer, or to a particular place, the property does not pass until the goods have been delivered to the buyer or reached the place agreed upon."

Referring to this provision of the statute the court said in this terra cotta incident, "The merchandise was ordered for delivery at defendant's job site at Perryville, Maryland. The stipulation recites that the seller was required to ship the merchandise by freight to the buyer by a carrier not specified by the purchaser to the point of destination. This language without more indicates an intention that the property in the merchandise was not intended to pass to the buyer until physical delivery at the point of destination was accomplished."

Electric Current Shortage

A Florida cold storage plant applied to an electric utility for current. The utility determined after an inspection the amout of current required and supplied the amount agreed upon.

However it later reduced the amount of electricity furnished with the consequence that the contents of a refrigerator spoiled from lack of adequate refrigeration. In an action brought against the utility to recover the amount of the loss, one of the judges of the court dissented from the majority who held that no liability rested on the utility for this loss.

In that dissenting opinion this member of the Florida appellate court said,

"A contract to supply electrical current or power is not only binding but may and must be performed according to its terms and the proper construction thereof, unless there is a sufficient excuse for non-performance and where one party fails to perform without adequate excuse, he is liable for damages."

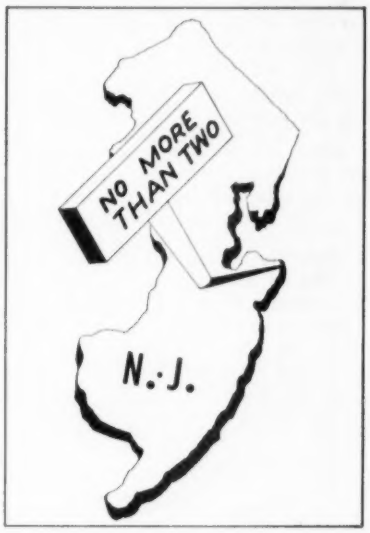
Nevertheless the majority of the court, deciding in favor of the utility, held that,

"No public utility corporation should be required to become an insurer by anything less than an express contract on its part to assume such responsibility and obligation. Certainly it is true unless such corporation is at least given an opportunity to refuse to enter into such a contract or to fix a higher rate for its services in the nature of a premium to it for the entailed and otherwise uncompensated expenditures such as the cost of establishing and maintaining an emergency or 'booster' plant or system, which would be entailed were it to enter into a definite contract requiring such unusual responsibility and assumption of risk."

Exclusion of Heavy Industry

A small residential community in New Jersey adopted a stringent zoning ordinance that, except for small local shops employing one or two workers, "No manufacturing except as above set forth shall be permitted."

A tract of land had been purchased within this area for the manufacture



of concrete slabs. The New Jersey court, setting aside a decision of a lower court granting this land owner an exception to the application of this ordinance, said,

"Sound social, economic and governmental policy dictates a separation where possible of residential areas and industrial areas. In the case of our older and fully developed communities it is now too late to do more than preserve such beneficial features as may have survived the period of spontaneous and uncontrolled growth and by such costly measures as slum clearance and low cost housing, to attempt to rectify the unwholesome conditions caused by our earlier lack of foresight.

"Proper zoning today, however, can do much in our newly developed communities to provide and maintain safer and more healthy living

COURT DECISIONS

conditions. And where as here there exists a small residential municipality, the physical location and circumstances of which are such that it is best suited for continuing residential development, the power of the municipality to restrict its territory to residential purposes with ample provision for such small businesses, trades and light industries as are needed to serve the residents, is clear."

Loss From Free Parking

A woman in Richmond, Virginia had for many months left her car on a parking lot without charge. On the last occasion on which she parked her car, a workman called shortly after she had left, representing himself to be an automobile mechanic and asked for the car which the parking lot proprietor readily gave him. Four months later the car was found a battered wreck by a North Carolina roadside.

In its decision in favor of the parking lot proprietor in the suit brought by the woman for the loss of this car, the Virginia Supreme Court summarized the law governing the liability of parking lot proprietors for loss or injury when a car is parked without charge, solely for the benefit of the car owner and without profit to the parking lot proprietor.

"The parking company was without reward or gain. It is clear that under such circumstances the company owed only a slight degree of care and that liability could attach only if it were guilty of gross negligence, which is said to be akin to fraud.

"One receiving possession of an automobile for the purpose of storing or repairing it without compensation is only liable for the automobile or for injuries accruing to it while it is in his possession, in case of bad faith or in case he has been guilty of gross negligence."

Injuries from Exposed Set Screw

A workman in a New Hampshire fiber plant was detailed to the supervision of a chip conveyor. The most convenient place for him to stand for this work was near a hanger supporting one end of a shaft, held in place in the hanger by a collar fastened by a projecting set screw.

This projecting set screw caught in the clothing of the workman, carrying him around the shaft with serious injuries. The New Hampshire court, sustaining a judgment in favor of the workman against the plant owner, said,

"Notwithstanding the employee knew that collars were used to hold shafting in place; that they were attached by set screws; that it was dangerous to come in contact with a set screw when the shaft was in motion and that a collar was needed on this shaft—the employee can recover if he neither knew nor was in fault for not knowing of this collar, for it can be found that using such a collar in that place created an abnormal condition of the employer's instrumentalities and it is an employer's duty to warn even experienced servants of the dangers peculiar to such a condition of his instrumentalities of which he either knows or ought to know and of which employees neither know nor are in fault for not knowing.

"Although he could have seen the collar when the shaft was at rest if he had looked for it, he had nothing to do with it and there was nothing about it calculated to attract his attention. It cannot be said, therefore, as a matter of law, either that the employer was free from fault or that the employee assumed the risk of his injury."

Liability for Employee Negligence

A company in Kilgore, Texas, furnished an employee with an automobile for use in company business as well as in his own personal affairs, the company paying the fuel and repair expenses incurred.

This employee, driving this car of the company, stopped at a hotel for a conversation with two customers of his firm and later while returning home after a personal call, hit and injured a pedestrian.

The Texas appellate court holding the company to be liable for the damage inflicted by this employee, said,

"The rule in this state is that if the act complained of is done within the scope of the general authority of the servant in furtherance of the master's business and for the accomplishment of the object for which the servant is employed, the master is liable. The implied powers of an agent are particularly broad in the case of one acting as a general agent or manager, since such a position presupposes a degree of confidence and investiture with liberal powers for the exercise of judgment and discretion within the general scope of the business entrusted to him.

"And where the servant is permitted at his own discretion to mix his own private affairs with those of the employer, the courts will not undertake to make nice distinctions and fix with precision the line that separates the act of the servant from the act of the individual where it appears that the act in question occurred at a time when the servant was engaged in the performance or furtherance of matters coming within the scope of his employment."

When Place of Delivery is Not Specified

A famous decision of a federal court in an action involving the place of delivery of a barbed wire shipment to the Republic of France during World War I has become an authority in determining this feature in sales contract performance.

The action in this instance was brought by the French Government against a United States wire company for the failure of the manufacturer to make deliveries of this barbed wire as agreed in which a determining feature was the place of delivery.

"If the seller has his goods at the shop or produces them at his factory and if nothing is stated in writing with respect to place of delivery, the law operates upon a presumption of fact that the seller's place of business was mutually intended," asserted the court in its decision.

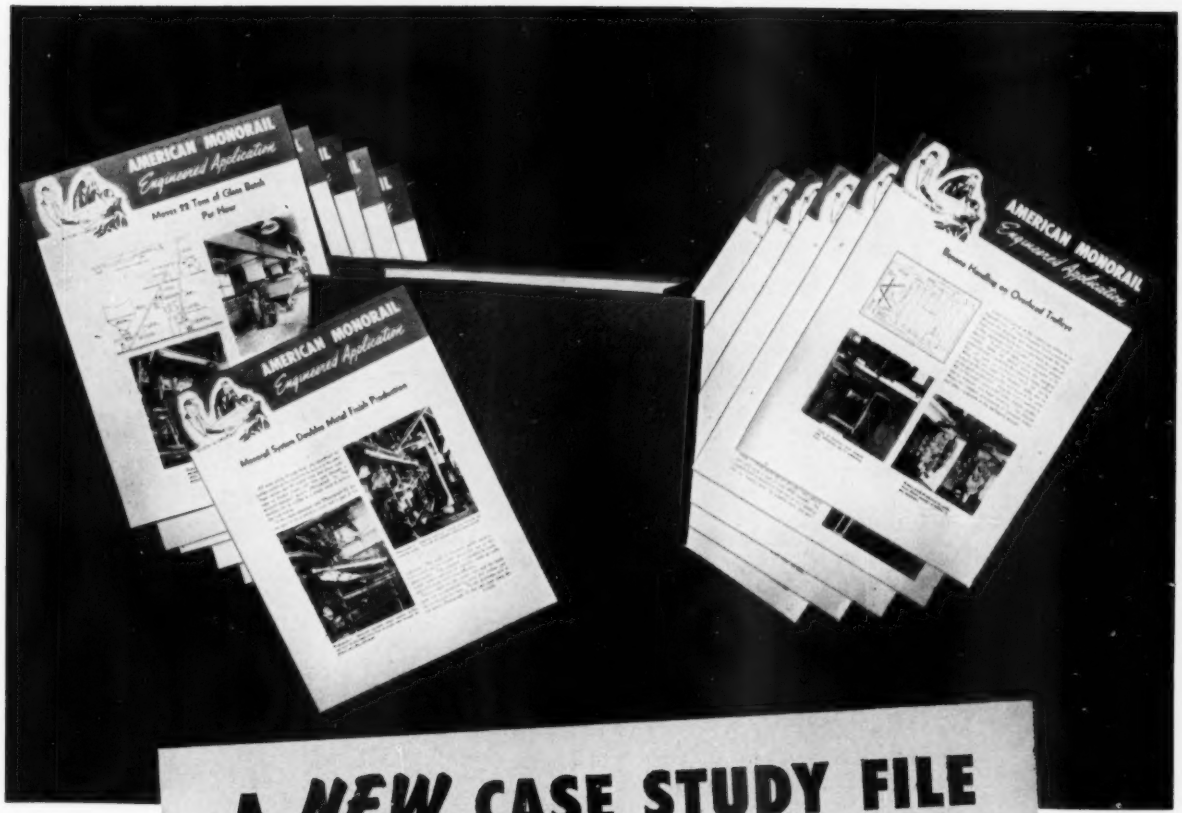
"If the seller assumes to put the goods aboard cars at his own expense and further assumes to pay the freight to the buyer's station pressed only as effecting the seller's net price, the seller has fulfilled his obligation to deliver by placing the goods on the cars and title passes at once to the buyer."

Falling Building Insurance Clause

A fire insurance policy covering a four story brick building and its contents at Gainesville, Georgia, provided, "If a building or any part thereof fall, except as a result of fire, all insurance by this policy shall immediately cease."

A tornado hit Gainesville and this building was demolished to the accompaniment of a fire and completely destroyed. In determining whether the loss was within the exemption of this falling building clause the Georgia court said in its decision in favor of the owner of the building.

"If the fire began after the fall of the building there could be no recovery on the policy. If the fire started before the fall of the building, but the destruction was not complete before the fall, a recovery may be had and if the fire after the fall was a continuation of the fire in progress before the building fell, a recovery may be had on the policy."



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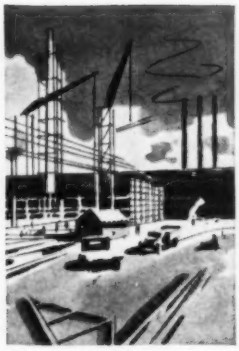
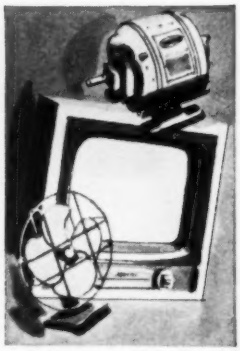


GENERAL INDUSTRY



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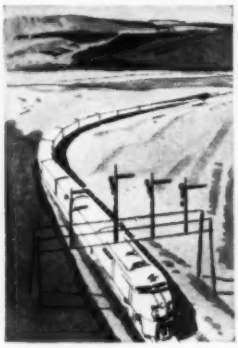

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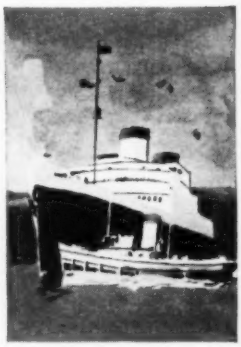

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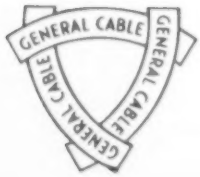

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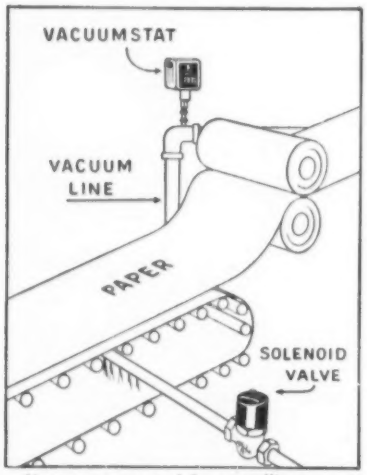
Vacuumstat turns on water spray when paper web breaks

On a Fourdrinier paper-making machine, the web of paper is formed on a fast-moving metal mesh, called the "wire". By the time it reaches the end of the wire, the watery stock has had enough water extracted from it, by gravity and by vacuum, to produce a web that can support its own weight. Should this web break, the stock will cling to the wire, be carried around to the starting or "wet" end of the machine, and cause uneven thickness of the paper.

To remove excess stock, a spray of water showers down on the return wire. But excess water consumption proves costly—so Joseph Van Thiel, instrument engineer at Combined Locks Paper Co., Little Chute, Wisconsin, devised a simple control system which would turn the water on only when it's needed.

A Honeywell *Vacuumstat* is located in the vacuum line for the first press. When the web breaks, the vacuum drops —so this gives an immediate and foolproof signal of web failure. The *Vacuumstat* controller is connected to a solenoid valve in the water line that supplies the sprays. Thus the spray is turned on the instant the web breaks . . . and keeps cleaning the wire until the sheet once more feeds properly from the machine.

This simple arrangement is typical of the ways that the more than 7000 Honeywell control devices can be utilized in an endless variety of applications. Ruggedly built in every detail, these controllers are completely dependable . . . and they're backed by Honeywell's nationwide service organization.



Vacuumstat *control for controlling spray on wire.*

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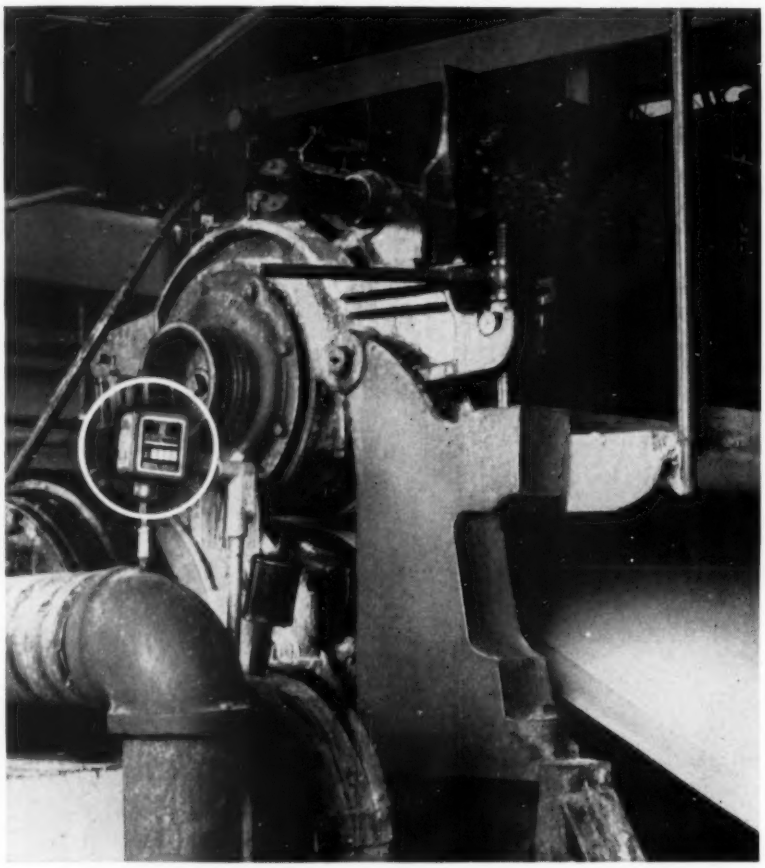

Honeywell vacuum controller *protects paper production*

Troubles begin whenever there's a break in the web of newly-formed paper coming off a Fourdrinier paper machine. The first thing that has to be done is to keep the "wire" clean of pulp to avoid uneven thickness of paper. Combined Locks Paper Company has worked out a simple, economical way to do this—by means of a Honeywell *Vacuumstat* Controller.

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This means easier handling and installation, less expensive hanging, lighter floor loading.

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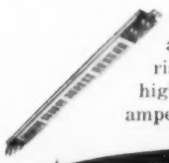
Quick Facts ABOUT ALUMINUM FLEX-A-POWER

***TYPE FVK.** A plug-in busway with power outlets at one-foot intervals, tapped by Flex-A-Plugs of the fusible switch or molded case circuit breaker types. 225-800 amperes, to 600 volts. (3-phase 4-wire 277/480 volt type available in 225 and 400 ampere ratings.)



***TYPE LVD.** For high capacity, low voltage drop, feeder applications, or as a riser in multi-story buildings carrying high currents over long distances, 600-4000 ampere ratings, to 600 volts.

*Also available with copper bus bars. Light- and heavy-duty trolley busways available with copper bus bars only.

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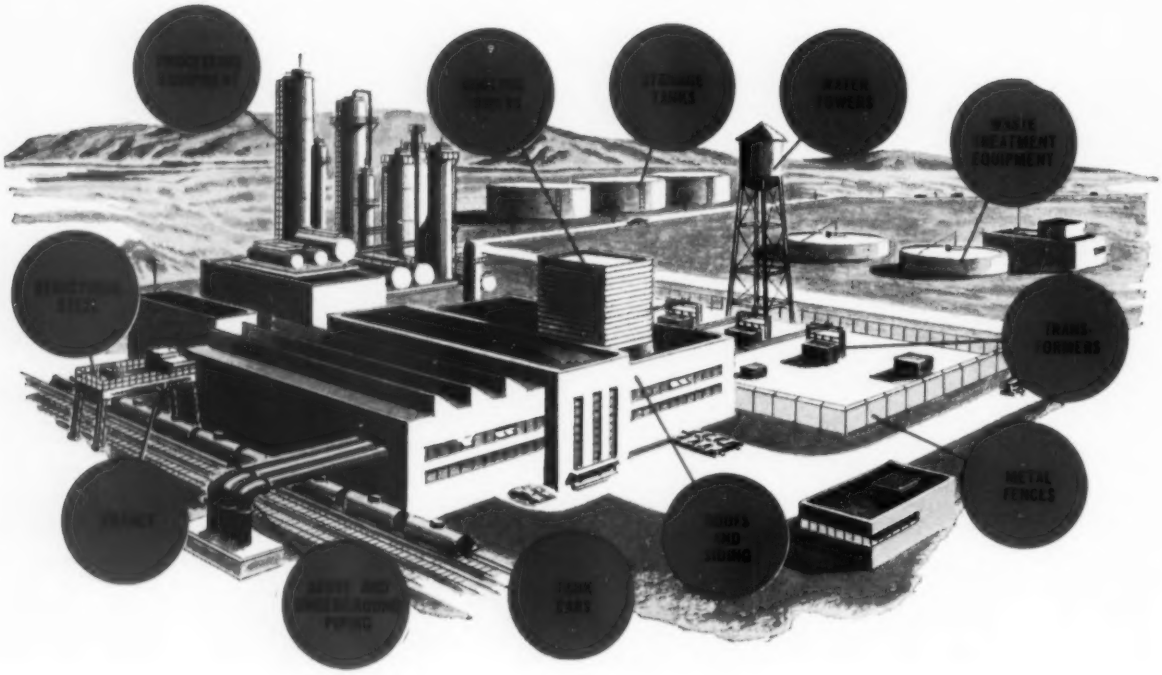

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This is a view of the main entrance to the plant. Note how the underside of the canopy blends with the ceiling on the inside. Varicolored stone construction similar to that used on the outside wall is also used in the receptionist's area

Plant Design Combines Utility, Comfort and Good Looks

THE EFFECT of 10,000 man-hours of planning that went into the layout of Atwood Vacuum Machine Company's new plant in Rockford, Ill. begins to be felt as soon as one enters either the manufacturing or the office areas. Planned with one eye on the beauty of design, combined with functionalism, ease of maintenance, good materials handling, the company still kept in mind the necessity for comfortable working conditions, good lighting, sound reduction and safety.

During the planning stages it was decided to make the basic structure of steel. This type of construction was used in preference to one using reinforced concrete or pre-stressed concrete because of the ease of erection and the relative simplicity of attaching ductwork, craneways, hoists, utility lines and auxiliary plant equipment.

Prefabricated trusses were preferred to steel beams for overhead framing inasmuch as these would lend themselves nicely to the support of various service lines which could be located within the trusses themselves. Beams would be unduly heavy for the 60 ft span and utility lines supported underneath would take away some of the headroom gained.

The determination of bay size was based upon the most economical dimensions that a selected steel fabricator could follow in volume production. It was originally felt that a standardization of all bay sizes in all areas, including the office spaces, would bring about a material saving. It was found that the lowest price could be obtained from a supplier who would furnish steel in 30 by 60 ft bay sizes. This bay size was considered satisfactory for the plant.

At the northernmost end of the plant, there are two rows of low bays which are 17 ft to the roof in height and 60 ft in depth. Offices as well as shop facilities, the main locker room and cafeteria, are located in these bays. The steel structure in this portion of the plant is similar to that of the rest of the plant. It has simply been a job of constructing ceilings and partitions to adapt this area for offices and other services.

Some of the high bay areas in the manufacturing parts of the plant are served by cranes despite the fact that power and air lines run overhead to machinery and equipment. This has been made possible by providing aisleways to take care of crane load clearances. These passageways run parallel to the crane rails from east to west; crane trolleys move lifts between the lines to the aisleways.

Equipment in the low bay manufacturing areas is of such character that, with the exception of the automatic plating unit and some of the heat treating units, it can be moved with the use of large forklift trucks.

Material handling is a sizable job. Approximately 4,000,000 lb of material have to be moved during one day. For this reason, mechanical methods of handling are used extensively. Forklift trucks, stacking containers, hoists, conveyors between operations, pallets, shipping racks are employed in the monthly production of thousands of parts. These include hardware items, automobile parts, truck and trailer articles, stampings and sheet metal assemblies.

In line with the thought of open planning there is a minimum of permanent partitions in the plant. Besides two enclosed transformer and switchboard rooms there are two small restrooms for production area personnel. An unusual floor space-saving feature is embodied in the location of supervisory offices on top of these plant washrooms. Liberal use of glass makes it possible for supervisory people to overlook entire departments.

Acoustical treatment was given to some of the manufacturing areas. Glass fiber panels, 2 ft by 4 ft by 2½ in., were inserted in simple sheet metal channels welded to the building trusses. These do not interfere with the normal clearance and provide for a large measure of sound

reduction. They fit very well with the depth of truss, approximately 4 ft 6 in. This allows for the movement of trailer trucks throughout most of the plant.

For noise reduction in the office areas, 6 in. deep vertical baffles are used on 6 ft centers. They not only have the function of noise damping but also that of supporting the translucent ceiling material.

The plant access doors, including a large 22 ft railroad door, are of a roll-away type and are electrically controlled.

The curtain walls in the plant consist of concrete, insulated steel panels and glare tinted glass in steel sash. In order to prevent a confined feeling on the part of the employees, sufficient clear glass was left at the bottom of the glass to permit outside vision. The movable parts of the windows have been placed at an elevation of 8 ft above floor level to prevent pilferage from within.

At the main entrance to the building, it is noticeable that the treatment of the outside canopy and the lobby is identical; the slight slope of the canopy is carried through to the rear of the lobby area.

The north wall, common to the building and office areas, is made of vari-colored stone to a height of about 38 in. Above this is plate glass extending to the 12 ft high ceiling level of the offices.

Above the ceiling of the offices, are 5 ft deep trusses which support the air conditioning ducts and fluorescent fixtures. Sparkling white paint is used above the ceiling resulting in a large amount of light reflection through the corrugated vinyl plastic below the trusses. This decorative translucent material is supported by 6 in. deep acoustic baffles.

Generally speaking, fully enclosed private offices were used only for division heads and top management executives. All other employees have been provided a measure of privacy by 6 ft high modular panels which are fitted with either translucent or clear glass top sections. This avoids the feeling of confinement.

Noisy office equipment is isolated in this room. Vertical baffles along translucent ceiling are used for sound deadening. Windows eliminate feeling of confinement

It is also possible to arrange these modular panels to suit the necessary requirements of space division. They are effective in saving floor space and provide a measure of neatness to the overall appearance.

To the right of the entrance, a well-lighted room contains a scale layout of the plant. Here one can get a bird's-eye view of equipment and department locations.

Further to the right and adjacent to the lobby are the purchasing department and the clerical pool. Nearby, a large enclosed area has been set aside for noisy office equipment. This room is acoustically insulated but, once more, the feeling of close confinement is eliminated by liberal use of glass.

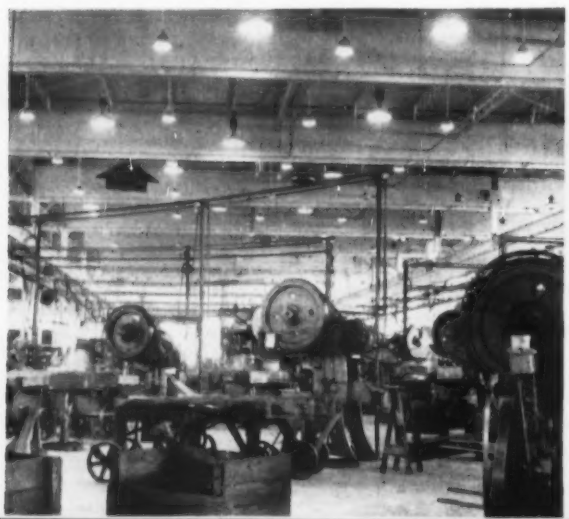
The walls of the private offices are constructed of 7 ft high structural glass. These walls have a dual function in that they present a pleasing architectural treatment and transmit borrowed and natural light as well.

Simplicity was the by-word in the construction of the majority of the permanent interior partitions. A non-glare, gray-brown vinyl material, purchased on special order, was used to cover ⅜ in. thick plywood panels. The special material was simply folded over the edges and stapled to the plywood panels. The covered plywood was then fastened to 2 by 4 in. studs placed on 2 ft centers. These panels take a great deal of punishment of all kinds, including hard blows, without damage. In addition, they can be washed. Because of their color, they add a cheerful note to the overall office area.

In general, an effort was made to make the office arrangement correspond to the flow of paper work. Liberal use was made of glass and materials requiring a minimum of maintenance. Open planning and relatively light colors were employed to present a bright and cheerful feeling.

The clear functionality of design has made for savings in maintenance, savings in material handling, and provides for expansion and rearrangement with minimum expense.

Panels of acoustical material can be seen in the upper portion of the view. Power and air lines run overhead to machines from supply lines alongside building columns



Material to be processed is supplied to the operators in skid boxes mounted on wheeled units. Boom and column behind each press are a part of the operator safety device

Abrasive Belts Help Grinder Up Its Output

TWO COATED abrasive belts are the elements of a new centerless grinder that removes 2 lb of stock from a 15 ft length of 2.375 in. o.d. tubing in two minutes. The new process makes possible, it is reported, a grinding rate of cylindrical stock faster than any other method of precision grinding.

For Grinding Extruded Tubing—Although this method of grinding is adaptable for fast finishing of cylindrical stock of most materials, it was developed primarily for grinding stainless steel and other high alloy tubes produced by the Ugine-Sejournet extrusion process, in which the hot steel billet is forced through a Fiberglas lubricated die. Extruded tubing thus produced must be ground to remove the rough surface that results from the high extrusion pressures, and to remove taper from the cylindrical stock (up to 0.020 in. per 15 ft length). Stock removal and not surface condition was the major consideration in finishing the extruded tubing, but 20 to 30 micro inch finishes are obtainable using fine grit belts. Tolerances of plus or minus 0.001 in. taper, end to end, are held.

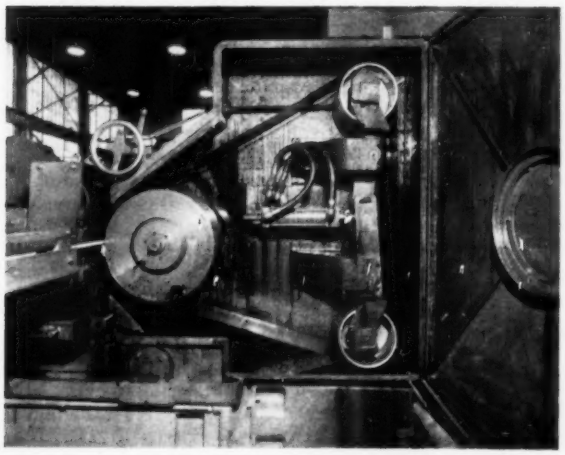
Uses Two Abrasive Belts—Two coated abrasive belts are used on the machine. A 50 grit aluminum oxide waterproof cloth abrasive belt 9 in. wide and 168 in. long does the grinding. The work is fed past the grinding belt by a 220 grit aluminum oxide waterproof cloth abrasive regulator belt 9¾ in. wide and 58 in. long.

A cutting oil lubricates the grinding belt. Sprayed on the belt by a fan type nozzle, the recirculating lubricant flushes away the grinding swarf and prevents rewelding of the chips.

Grinding Belt on Steel Contact Wheel—A steel contact wheel mounted on a 4 in. shaft supports the grinding belt against the work. The use of steel contact wheels is a new concept in grinding with coated abrasive belts. In addition to backing up the belt, the steel wheel serves as the belt drive pulley. Driven by V-belts from a 25 hp electric motor, the 20 in. diameter wheel forces the belt past the work at speeds of 3500-10,000 sfpm. It is rigidly mounted in ball bearings to prevent deflection under the very high grinding pressures imposed on it. The steel contact wheel weighs approximately 350 lb.

Oil flows from the fan-type nozzle above the work onto the abrasive belt. The grinding belt then passes over the steel contact wheel at the right and the regulator belt passes over the flat platen at left. Distance between the belts can be adjusted for tube sizes ranging from 1 to 6 in. in diameter

Coated abrasive grinding belt passes over a steel contact wheel, at left, and two idler wheels. The lever-mounted idler wheels maintain belt tension. Power is transmitted from 25 hp motor by multiple V-belt drive to contact wheel



Uniform Pressure Across Grinding Belt—By setting a small taper between the contact wheel spindle and the face of the back-up platen, a uniform rate of stock removal is maintained across the entire belt width.

Grinding Results—The main objectives of this method of grinding are: 1—to remove stock from the extruded tubing at a faster rate not obtainable by any other method of grinding; 2—to remove the Fiberglas skin and extrusion die marks; 3—to remove the taper from the tubing; and 4—to provide an acceptable finish on the tubing. Tests have demonstrated that the coated abrasive belt grinding process with cutting oil as a lubricant will accomplish these objectives.

Data compiled by the Behr-Manning Products Engineering Department indicate that the coated abrasive belt grinding process is economically practical. A series of test runs made using one belt on 12 bars of Timken 52,100 alloy steel showed that the belt removed as much stock during the last pass of the twelfth bar as was removed during the first pass of the first bar. Throughout this series of tests, the work feed angle and the work feed rate remained constant.

Because of the rigid construction of the machine, and its high ratio of horsepower to belt width (nearly 3 hp per inch of belt width) extremely high grinding pressures can be developed. Full advantage is taken of the inherent ability of coated abrasive belts to remove tremendous quantities of stock without overheating the work and causing burning, distortion and loss of dimensional accuracy. The new process is the result of cooperative engineering between Behr-Manning Corp., and Production Machine Co.

Fig. 1. General view of Ignitron rectifier installation that supplies power to production facilities at Ashtabula plant

Application of Shunt Capacitors to Ignitron Rectifier Installations

The authors here present a review of the effects of harmonic currents in Ignitron rectifier installations, the symptoms that indicate the presence of harmonic currents in capacitor units, and the solutions to the problem

By C. E. BUTERBAUGH, Plant Electrical Engineer, National Distillers Chemical Co., and F. N. McCLURE, Electrical Utility Engineer, Westinghouse Electric Corporation

SHUNT CAPACITORS are being applied in increasing numbers to provide voltage and power factor improvement in connection with Ignitron rectifier installations. In several such applications, the problem of harmonic currents in the capacitors has been encountered and suggests a review of the effects of harmonic currents in capacitor units, symptoms that indicate the presence of harmonic currents, and the solutions to the problem.

Capacitors do not generate harmonic voltages, but they do provide a current path when connected to equipments that do. The reactance of capacitors varies inversely as the applied frequency, and small harmonic voltages can cause relatively large capacitor currents to flow. The order of the harmonic voltages that appear on the a-c side of Ignitron rectifiers depends on the number of rectifier phases. The fifth and seventh harmonics predominate in a six-phase rectifier, the eleventh and thirteenth in a twelve-phase installation, and the seventeenth and nineteenth in an eighteen-phase rectifier.

Capacitor units are designed to carry 135 per cent of the nameplate kva rating. A reasonable harmonic current in addition to the fundamental is therefore not harmful. Since the reactance of capacitors decreases with increased frequency, the kvar loading contributed by the various harmonics for a given magnitude of current decreases with increased frequency.

Working Formula

The combined fundamental and harmonic kvar loading of a capacitor can be calculated if the harmonic content of the applied voltage is known. The kvar loading is determined from the formula

$$\text{kvar} = E_1^2 + 3E_3^2 + 5E_5^2 + \ldots$$

where kvar is a fraction of the capacitor rating and the voltages are a fraction of rated voltage. If the capacitor current contains only one harmonic in addition to the fundamental, the curves of Fig. 2 can be used to determine the permissible rms capacitor current for a given value of rms capacitor voltage.

For example, if the capacitor current contains only the fundamental and fifth harmonic, and the rms voltage applied to the capacitor is equal to rated voltage, the permissible rms capacitor current is 177 per cent of the rated value.

The portion of the power supply system involving the shunt capacitor bank at the Ashtabula plant of the National Distillers Chemical Company is shown in Fig. 3. The

capacitor bank was added for power factor correction, and to raise the voltage on the 13.8-kv bus that supplies the 40,000-amp, 650-volt, 12-phase Ignitron rectifier installation. Rated current of the 5100-kva capacitor bank is 214 amp.

The presence of harmonic currents in the capacitor bank was detected from high ammeter readings in the capacitor circuit. On one occasion, a maximum capacitor current of approximately 185 per cent of rated current was measured with breaker No. 1 open and breakers 2 and 3 closed, and the overcurrent relay tripped off the capacitor bank. Had all of the harmonics present been generated by the 12-phase rectifier, predominant harmonics would have been the eleventh and thirteenth.

Harmonic Analysis

However, there was a possibility that harmonics of lower order than the eleventh were present due to harmonic sources in the system other than the rectifiers. Therefore, the only positive method of determining the actual kvar loading of the capacitor was to find the harmonic content of the capacitor voltage with a harmonic analyzer or by some other means.

Such a harmonic analysis was made. The fundamental component of the applied voltage was 99.6 per cent of rated voltage, the eleventh harmonic was 13 per cent, and the thirteenth harmonic was 4.3 per cent for the circuit condition giving the highest value of capacitor current.

Although other harmonics were present, their values were so low as to have negligible effect on the kvar loading. By using the formula relating kvar and the harmonic voltage components, the kvar loading was calculated to be 120 per cent of rated value, which allows a reasonable margin below the permissible kvar of 135 per cent.

Thus, the harmonic analysis and subsequent calculations showed that the capacitors were not being thermally overloaded. The relay setting of the overcurrent relay associated with the breaker controlling the capacitor bank was increased from 400 to 450 amp to prevent unnecessary tripping. This setting is low enough to provide some thermal protection for the capacitors so long as there is no system change that would produce significant magnitudes of harmonics of lower order than the eleventh.

In some, but not all, cases it is not necessary to make a harmonic

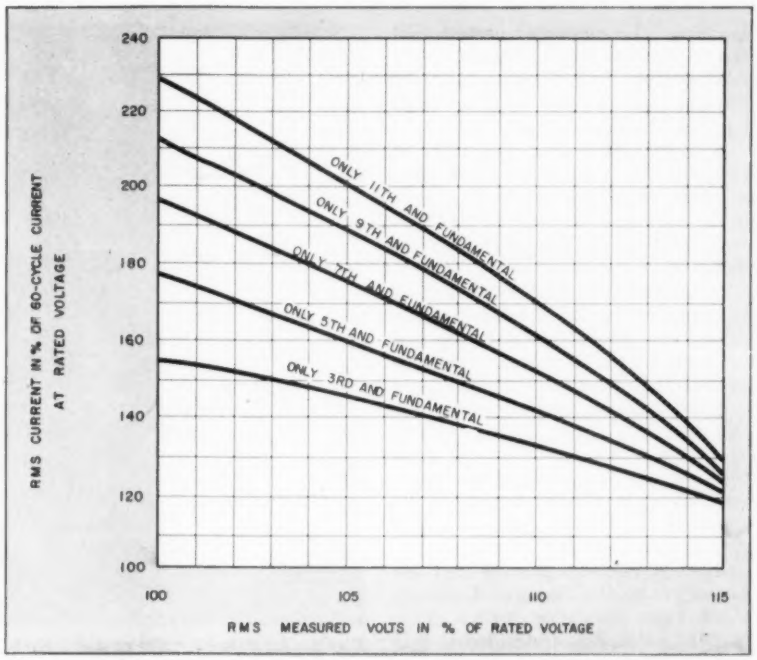
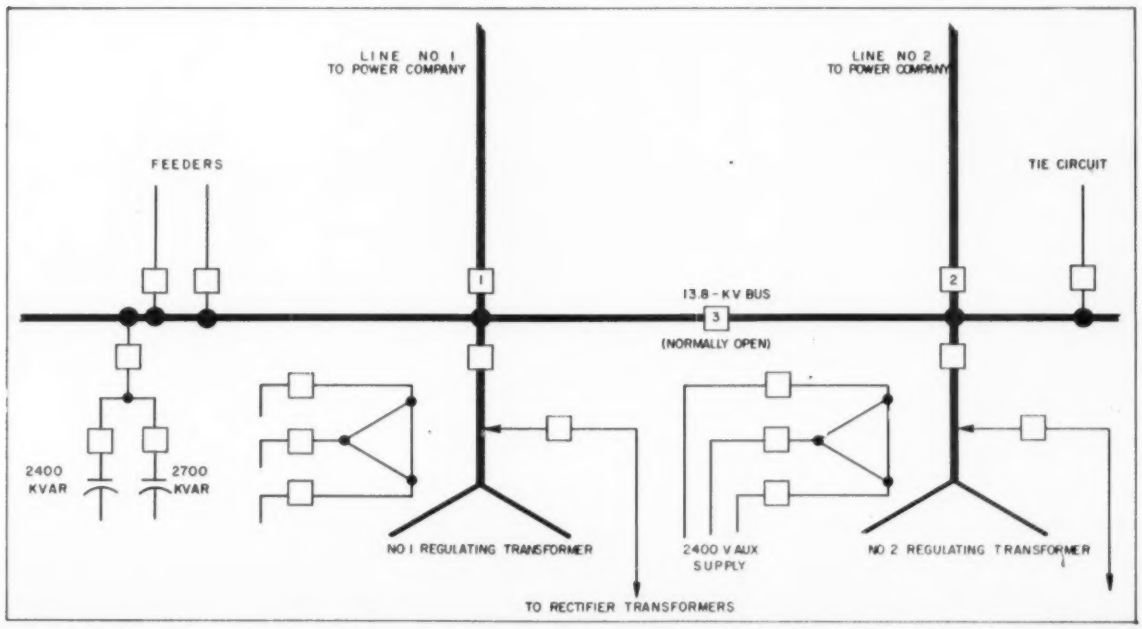


Fig. 2. Permissible harmonic currents for various fundamental voltages, based on a capacitor unit designed to carry 135 per cent of nameplate kva rating

Fig. 3. The power supply system involving the shunt capacitor bank at the National Distillers Chemical Company plant



analysis. For example, assume that the capacitor bank current at a twelve-phase rectifier installation is 150 per cent of rated 60-cycle bank current at rated voltage.

Although there is a possibility of capacitor harmonic currents of lower order than the eleventh due to other harmonic sources in the system, there would normally be none lower than the fifth.

It can be assumed, therefore, that the most severe kvar loading of the capacitors would occur if the 150 per cent current consisted of fundamental and fifth harmonic only.

Since the permissible current for this case is 177 per cent, as shown in Fig. 2, there would be no need to make a harmonic analysis. Such an analysis is necessary only if the capacitor current exceeds 177 per cent at rated voltage.

After it was determined that the capacitors at the National Distillers plant were operating within their thermal limit, it was decided to add another 2400-kva bank to further improve the power factor and voltage conditions.

The addition of this bank made no appreciable change in the current in per cent of rated bank current. It was concluded that the bank was operating within the thermal limit and no further tests were made. However, the current transformer rating and the relay setting had to be increased because of the increased bank current.

Danger Signs

In conclusion, shunt capacitors installed at Ignitron rectifier installations may have currents higher than normal due to the harmonic voltages generated by the rectifiers. This condition is not serious unless the thermal limit of the capacitors is exceeded. If the rms current does not exceed the permissible current for fundamental and fifth harmonic only, as indicated in Fig. 2, for the particular operating voltage, the capacitors are probably operating within the thermal limit.

If the current exceeds this value, a harmonic analysis should be made to determine the harmonic content of the capacitor voltage. This data is used to determine whether the kvar loading of the capacitor exceeds 135 per cent of rated kva.

If the thermal limit is not exceeded, the only corrective action required is to insure that the current carrying capacity of current transformers and other equipment is adequate and that relay settings are sufficiently high to prevent unnecessary tripping of capacitor bank.

Fig. 4. An over-all view of the 7500-kva, 13.8 kv outdoor shunt capacitor bank

Fig. 5. Close-up of one of the capacitor racks, showing capacitor fuses (arrow)

NYLON AND TEFLON

No Sissies Here!

Both of these plastics have earned their places in industrial plants through frictional toughness, indifference to abuse, ability to withstand attacks of most chemicals

NYLON

NYLON HAS become increasingly important in industrial applications. Nylon rod, strip and tubing are not only machined into parts to replace strategic metals but also are opening up new fields where no other material can be used satisfactorily. Probably the largest industrial application for nylon is in the form of bearing surfaces for all types of equipment. Whether the parts are blanked from strip to form thrust washers or machined from rod to form bushings or bearings, the properties of nylon seem ideally suited for this type of use.

No charts or graphs have been prepared to determine at what loads or at what speeds the limiting factors are for nylon's adaptability. The primary limiting factor for bearings of this material is in the frictional heat which is built up. Upper limits of loads and speeds can be extended by providing for the dissipation of frictional heat either by the use of lubricants or through design of the bearing and housing.

The majority of nylon bearings are run without lubrication except for a drop of oil usually recommended for the "break-in" period. Their excellent bearing properties, even under adverse lubrication and wearing conditions, is of prime importance to both the food and textile industry where contamination by lubricants is a hazard.

Furthermore, nylon bearings also have excellent abrasion resistance even when dust, grit or other abrasive materials are present. Typical examples of applications utilizing these properties are: conveyor bearings, bearings in salt water (use of nylon also minimizes electrolytic action), and textile bearings.

Aside from these general properties and uses, nylon also has advantages in chemical plant operations. It is inert to all alkalies, solvents, organic acids and dilute mineral acids, according to The Polymer Corporation of Pennsylvania, well-known supplier of nylon and Teflon. This firm, however, does not recommend the use of nylon in contact with concentrated mineral acids, or molten phenol and formic acid. It has also been determined that nylon is fungus-resistant.

Wearing surfaces of many kinds have machined from nylon rod, bushings or slabs, or blanked from strip. Conveyor chain channels lined with Nylatron G[1], a graphite-filled type of nylon, have eliminated the need for lubrication, increased the wear life of the chains, lessened the noise problem and reduced the power consumption.

Scraper blades running in contact with metal rolls are replacing brass, spring steel and fiber in several applications due to longer wearing qualities and nylon's resiliency which reduces or eliminates excessive wear to the metal surface. The material's above mentioned abrasion resistance is well shown in an application in foundries. Nylon bushings are being inserted in core boxes which mold sand cores. A sand mixture is then blown into the core boxes under 100 psi. By inserting the nylon bushings the abrasion from the sand has been almost entirely eliminated and the frequent repairs formerly necessary have been reduced.

Thin wall nylon tubing is finding a wide range of applications in the electrical insulation field. Because of its toughness, heat resistance and high voltage electrical insulation properties, several companies are using this tubing in the manufacture of solderless connectors.

Machining nylon parts from rod or large diameter bushing stock has many advantages. Nylon machines readily either by hand-operated machine turning equipment or in automatic screw machines. By machining nylon it is possible to obtain closer tolerances than are presently obtainable with the injection molding process. Typical machined nylon parts are shown in Fig. 1.

In small quantity requirements it

[1]Nylatron is a trade name of the Polymer Corporation of Pennsylvania.—The Editors.

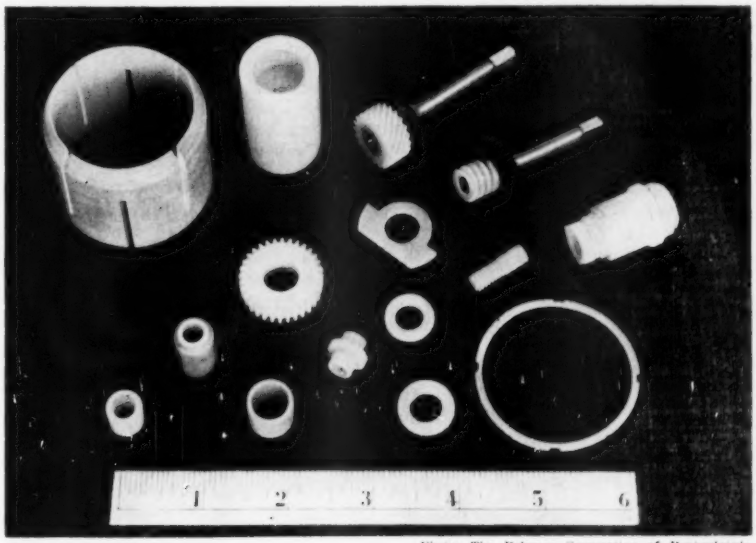


Photo: The Polymer Corporation of Pennsylvania

Fig. 1. Nylon may easily be machined either by hand-operated machine turning equipment or in automatic screw machines. Here are some typical parts which have been machined and have proven of value in reducing maintenance

is possible to eliminate the use of costly molds. In addition, if parts are machined it is possible to attain design flexibility without the loss of these same expensive molds.

There are other advantages to machined nylon parts which are pointed out by suppliers and fabricators: One of these advantages has to do with smoothness of surfaces. For example, valve seats, wherein a perfectly smooth seating surface is highly desirable, can best be obtained through machining.

One company, in processing of small diameter wire, found that the wire would gradually make a groove in the cold-rolled steel pulleys over which the wire passed. The pulleys eventually wore down to a sharp "V" shape and were then in such condition that they would score and roughen the finished wire.

This company decided to try nylon pulleys, machined from 2 in. diameter rod, along with both directional and guide pulleys. The resulting arrangement has practically eliminated the scoring of the wire and the life of the nylon pulleys has been approximately five times that of the steel pulleys.

Another company uses nylon sheaves which replaced a cast aluminum wheel used in spooling brass wire. The sheaves in this case have a diameter at the bottom of the "V" slot of about 4 in. and are machined from a hard cast bushing stock nylon. These sheaves, at latest reports, had been in operation almost a year with virtually no signs of wear. The aluminum which it replaced lasted only a week or two in service and, in addition, abraded the wire.

Nylon strip is readily formed into low friction, long-wearing, bearing liners. For example, a Philadelphia yarn manufacturer felt that nylon might help solve some of its many production problems. Figure 2 shows the nylon strip as it was installed in the pressure roll of a spinning frame.

In order to obtain a uniform thread the pressure roll requires a constant pressure and constant speeds. The biggest drawback of the formerly installed bronze bearings was in their lubrication. The grease became viscous with age or picked up dirt and these conditions caused varying speeds and pressures. Another disadvantage of using grease was the possibility of contamination of the yarn.

No fancy machining was necessary to install the nylon bearings. The maintenance man had only to cut small sections from a roll of the nylon strip 0.025 in. thick and 2 in. wide and insert them between the original shaft and bearings. No alteration of the equipment was required.

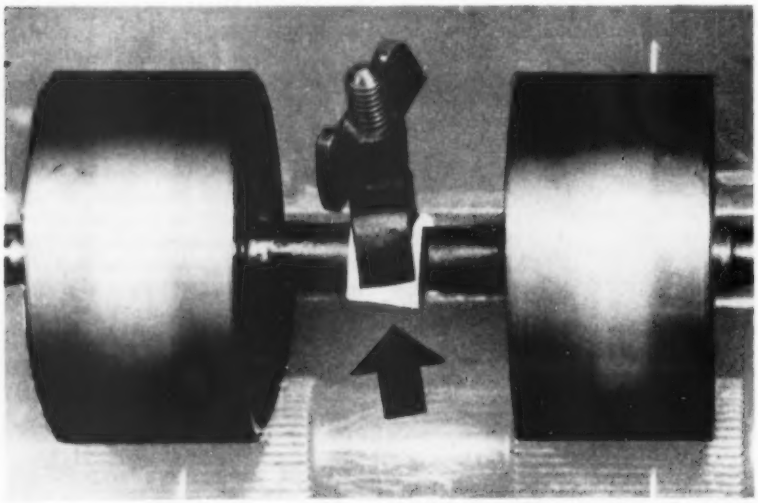


Photo: The Polymer Corporation of Pennsylvania

Fig. 2. Bearings made of nylon strip are shown installed on the pressure roll shaft of spinning frame. Shaft has to be moved under constant pressure, speed

The actual life of the nylon liners has not been determined, nor can any estimates be made. The original bearings were installed early in 1950. As yet, no replacement has been necessary and none is foreseen after more than two years of constant use.

Another spot in the industrial picture where nylon has shown great promise is in chemical solutions in the processing of pulp and paper. Serving as tips on a new pulp cleaner, Fig. 3, nylon under flow nozzles withstood both corrosive and erosive action of caustics, complex wood acids and dilute solutions of sulphuric acid.

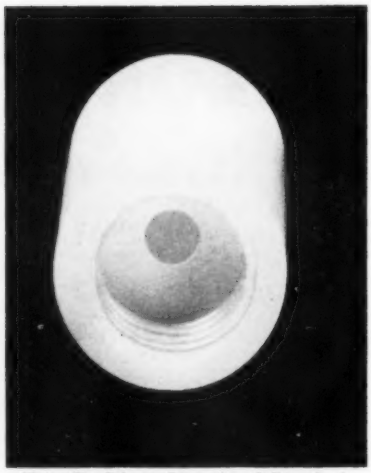


Photo: The Polymer Corporation of Pennsylvania

Fig. 3. This nylon part, installed underneath the flow nozzle used in a pulp cleaner, has withstood both corrosive and erosive action of the caustics used

These tips were machined from 1 in. diameter nylon rod and have been used on a recently developed pulp cleaning device. All parts of the pulp cleaner assembly are made of interchangeable hard rubber with the exception of the nylon nozzle, supplied by National Polymer Products.

Low-friction sintered nylon recently re-demonstrated its value as a bearing material by withstanding 18 months of continuous use in light production machinery with no lubrication or visible wear.

Six sintered nylon bearings, Fig. 4, were installed in place of bronze bearings on a conveyor belt roll-feed and horizontal back shaft of a machine used by the Ace Art Co. to make corners for mounting photographs.

Except for a few drops of oil for "break-in" at time of installation, the nylon bearings required no lubrication whatsoever. The machine has been in operation eight hours a day, five days a week since the Oct. 3, 1951 installation date. Laboratory and field tests indicate that bearings made by cold pressing and sintering nylon powder have an unusually low coefficient of friction and show great promise for use in frictional applications where operation without lubrication is required.

How to Work Nylon

Technical Bulletin No. 8, a publication of the Polymer Corp. of Pennsylvania, covering the various methods of machining nylon, is available in limited quantities. Readers who are interested please write the Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Ill. on their company letterhead.

TEFLON

TEFLON is a synthetic resin having a unique set of properties —it is practically chemically inert. The only materials which will attack Teflon are the molten alkali metals and fluorine and chlorine trifluoride at high temperatures and pressures.

Because few materials show any tendency to stick to its surface Teflon is being used in a variety of operations in which sticky substances are handled.

Furthermore, Teflon has truly outstanding electrical properties. As a low-loss dielectric material it is comparable to any known solid dielectric. Its electrical properties, in addition, are practically unchanged over its wide service temperature range.

If all of these properties were not sufficient to make it an outstanding industrial material, Teflon is, to round out the picture, tough and resilient, has no water absorption, and is unaffected by outdoor weathering, corrosion, or fungus attack.

As a Packing

One company was faced with the problem of finding a chemical resistant shaft seal for a centrifugal pump handling corrosive chemicals such as chlorinated benzol. The manufacturer finally decided upon the use of a solid Teflon seal which was to be finish-machined from a molded Teflon bushing. Since the shaft speed was approximately 850 fpm a small clearance between the shaft and the seal was advisable. The pump was inspected and found to have less than 0.002 in. gyration of the shaft as measured with a dial indicator. The pump shaft had a ground and polished finish and was in excellent condition. Service life of the packing previously used averaged one-half week; the one Teflon seal was in continuous operation for a year and a half.

Savings in labor for replacement of the seal and the increased production due to continuous operation were of prime importance. However, on checking costs, the user also found that although the original cost of the Teflon seal was ten times that of the conventional material, the packing cost alone saved the company more than twenty-four times the original cost of the Teflon seal.

Several types of Teflon spacers are being designed for air dielectric insulation. Air is the ideal dielectric material for high frequencies and the combination of Teflon spacers in this medium offers considerable advantage to the electrical engineer.

Basically, the principle is to allow for as much air space as possible, using Teflon spacers for insulating supports. This type of insulation is required for very high frequency where an extremely low loss factor is important to the operation of the equipment. Another advantage is that in operating at high temperatures the air will allow for the dissipation of heat more readily than a solid insulator.

Teflon is proving to be an outstanding material for use in the handling of sticky substances. By covering surfaces of equipment at critical points with Teflon a number of advantages can be realized. Some of these are: reduction in maintenance for cleaning; reduction in waste of material; elimination of additives to reduce stickiness; improvement of product quality; and improvement of overall operating efficiency.

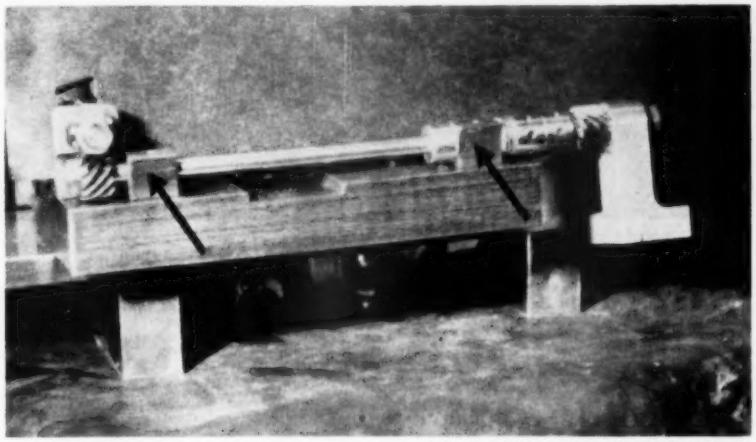


Photo: The Polymer Corporation of Pennsylvania

Fig. 4. Two stationary nylon bearings are used on this horizontal back shaft. They are press-fitted about 0.001 in. into steel hooks indicated by the arrows

In the Bakery Business

Bakers and manufacturers of bakery machinery have found that Teflon provides an excellent surface for bread-sheeting rolls. At one stage of the bread-making process the wet, sticky dough is rolled into a thin sheet by passing between two or more pairs of rolls. In the past these rolls have been made of highly polished stainless steel. In order to separate the sheet of dough from the rolls it was necessary to have accurately ground scrapers set against the rolls and to keep the dough liberally sprinkled with flour.

Maintenance of the scrapers presented a considerable problem because frequent regrinding was required and even the rolls had to be reconditioned occasionally. This situation was practically made-to-order for Teflon.

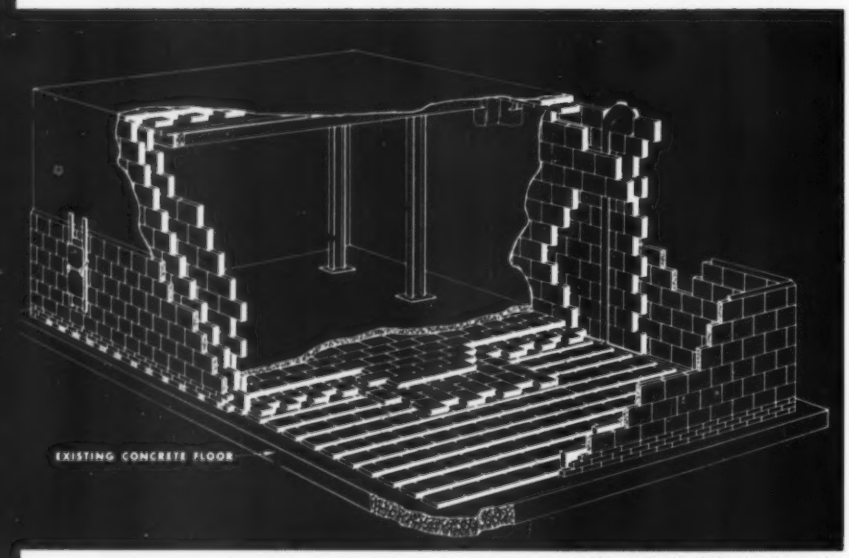
Heat sealer plates of wrapping machines was another place where Teflon found an easy conquest. Wrapping materials such as polyethelene, cellophane, Pliofilm and waxed paper are sealed by heating the folded wrap at appropriate points, by contact with heated metal plates. At their fusion temperatures, these materials are rather sticky and do not separate easily from the heated plate.

In some cases a residue is left on the plates which in time reduces the heating efficiency of the plate until seals are no longer obtained. A covering of Teflon on these plates not only eliminates sticking but also the build-up of foreign matter and carbon deposits. In addition, it also eliminates most of the drag over the plate. Teflon tape is often used for this application.

Teflon is being used, too, in guides, dead plates, hoppers, and folding parts of packaging machinery to reduce cleaning and improve operating efficiency. Spillage is often encountered in packaging operations and many of the spilled materials stick to machine parts and are difficult to remove. Furthermore, friction of the packages against guide rails and dead plates will often interfere with their proper movement.

The non-adhesive properties of Teflon can, it is pointed out by Polychemicals Department, E. I. du Pont de Nemours and Co., undoubtedly be used in many more places in industry.

Following are some of the applications already being considered: coating for molds for rubber, plastics and candy; end-plates for calender and paint mill rolls; covering for rolls used on paper machines and in steel pickling baths.



Photos: Pittsburgh Corning Corporation

Fig. 1. At the left is an artist's conception of the basic construction technique used to build the ice cream hardening room at Luick Ice Cream Co.

New Look at Construction CUTS COLD ROOM COST

By E. H. MARTIN, Pittsburgh Corning Corp.

WHEN FREEZING rooms are built on or below grade common practice calls for a floor excavation and the installation of ventilated space—an expensive and time-consuming job. The Luick Ice Cream Company, Milwaukee, when planning a new hardening room, was spared all this by taking a fresh look at the construction problem.

The floor of the cold room was built directly on the existing concrete wearing floor; 2 in. thick blocks of cellular glass insulation, Foamglas, were set on the floor which was "flood mopped" with hot asphalt. Blocks of the material were separated 4 in. at 18 in. intervals forming channels which ran across the room. Two layers of 4 in. thick Foamglas, with staggered joints, were then "flood mopped" in place over the entire area.

These successive layers of insulation were laid with joints butted firmly together forming a cover for the voids in the first layer. The tunnels formed by covering these voids in the bottom layer act as air channels for frost prevention. Warm air blown in the air channels by a fan furnishes the circulation necessary to prevent "frost heavage" in the sub-soil of the room. This air is exhausted through grill openings on the opposite side of the room.

The floor was completed by pouring a concrete wearing surface over the insulation. While this method of construction raised the floor area above the floor level in the remainder of the building, Luick felt that it in no way hampered material handling.

In order to avoid a thermal short circuit each roof-supporting steel column was cut off at the new floor level. Upon completion of the new floor the columns rested on steel plates, distributing the roof load over the concrete wearing floor.

The walls of the ice cream hardening room are composed of 4 in. thick concrete blocks and 2 layers of 4 in. thick cellular glass insulation. The joints and backs of the insulation were dipped in hot asphalt for bonding and sealing and all joints were staggered.

To complete the insulation envelope, 2 layers of 4 in. insulation were applied to the roof area of the building directly over the new room. This insulation was covered with standard built up roofing. The roof and walls were tied together by cutting an 8 in. slot in the roof around the perimeter of the room allowing the wall of insulating blocks to extend upwards to meet the roof insulation.

This construction method made it possible to put the new freezer in operation two months earlier than expected.

Fig. 2. Wall shows a—interior construction around door; b—wall construction; c—wall-to-roof construction; and d—finish

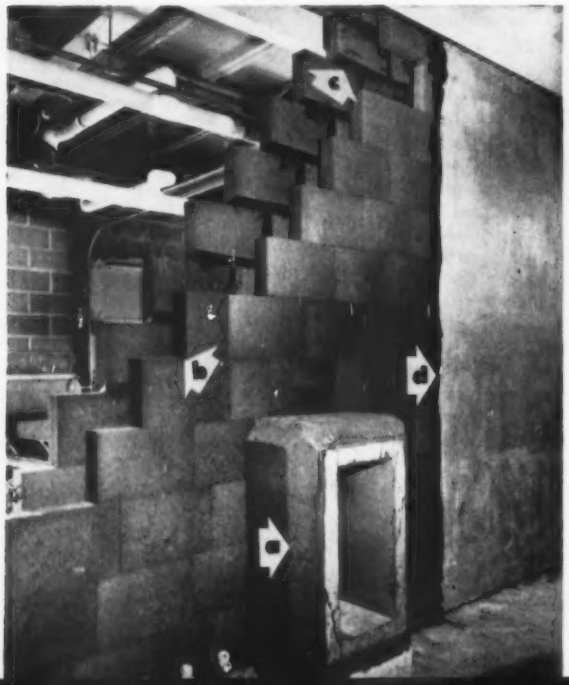


Fig. 3. Floor level of freezer is higher than outside area. Small grilles, arrow, are exhaust outlets for air channels

At the head table during the dinner period, left to right: W. Baldus, Outing Committee; W. Whitman, Outing Committee; J. Sweet, New Vice President; E. W. Benner, Retiring President; John J. C. Coffin, New President; L. C. Schoenherr, Secretary; F. Hatch, Honorary Member; Tom Hanson, Plant Engineering (guest); and L. J. Monty, Treasurer

Boston Club Outing Big Success —As Always

Annual outing of the Boston club is one indication of the high esteem held for plant engineers' organizations by manufacturers and suppliers in their areas

By **THOMAS E. HANSON**, Editor, Plant Engineering

ONE OF THE best-planned and best attended outings of the Plant Engineers Club (Boston), was held June 18 at the country club of United Shoe Machinery Company in Beverly, Mass. There were 105 members and guests present—one of the best turnouts yet recorded for this annual affair.

This is the one meeting of the year where the "do-as-you-please" sign is hung out. Some of the members and guests played golf, others bowled, some ate and some drank and some did both. This particular guest devoted himself to some very high class loafing but must also report that he was outloafed by several more accomplished professionals particularly from the north-of-Boston area.

Lobster Tomali, "Tiger Sweat" and other titled refreshments were served preceding the social hour—a roast beef dinner and prize drawing. Incidentally, there were prizes for everyone.

One of the most serious notes at the annual outing was an appeal for funds to aid families stricken in the Worcester tornado. One stimulus to the building-up of the Worcester Relief Fund was the auctioning of an electric toaster by Honorary Member Freeman C. Hatch.

Newly-elected officers included: John J. C. Coffin (Towle Silversmiths), President; James Sweet (Harvard Brewing Co.), Vice-President; Louis C. Schoenherr (New England Confectionery Co.), Secretary; Leo J. Monty (Artisan Metal Products) Treasurer; Leo J. Monty and Edward W. Benner (American Sugar Refining Co.) Councilors.

Announcing prizes were, left to right: Wayne Baldus and Willard Whitman of the Outing Committee; and new Vice President J. Sweet. Another feature of social hour was an auction, conducted by honorary member Freeman Hatch, for benefit of Worcester tornado victims

Three of the members in attendance sit one out; E. A. Elfstrom, Past President; T. H. Veinote, Elected Member; F. B. Hart, Honorary Member. All told, there were 105 members and guests present, one of the best-attended outings

3 Examples of How Ryan Aeronautical MOVES ON THE GROUND

Machine design group of Ryan Aeronautical's Plant Engineering Department has come up with many well-conceived methods, racks, and installations that speed up, and make safer gigantic task of materials handling

Custom Tailored Racks Save Floor Space, Stop Damage

MODERN DESIGN APPLIES to materials handling, as significantly as it does to the streamlining of an airplane. As the production of metal products at Ryan mounts, the efficient movement and storage of parts as they reach the advanced finished stage become increasingly important.

Three major factors must be taken into consideration—the protection of parts from damage or marring, the conservation of factory space and the ease of handling.

The most obvious means of transport for comparatively small parts is the "tote" cart, rectangular or square open-topped "box on wheels." The same cart which might be used for collecting scrap, has, in the past, been employed for moving valuable finished parts to the Shipping Department. As the carts were pushed by workers, there was ever-present danger that in

Fig. 1. Edges of rings for world's largest external fuel tanks don't rub against each other in new style rack. Old method of carrying the rings is shown at the right

Fig. 2. Neat storage of exhaust system sections for Pratt & Whitney engines is accomplished in new rack. Old cart-handling method which exposed sections to damage at right

Fig. 3. Ryan header sections for Pratt & Whitney engines are now racked vertically as shown at the right. They no longer jostle in carts with possibility of jamming or scratching

Fig. 4. Ryan exhaust systems for Continental engines can be carried in large quantities in new racks instead of in old-style space-consuming, damage-causing carts at the right

Fig. 5. Ryan-designed separate compartments in special type conveyance for General Electric J-47 jet engine cowls. Old method at right did not provide the necessary protection

Fig. 6. These combustion chambers for jet engine are carefully handled by new method, left which protects their precision-made surfaces to greater degree than did old method

jostling against each other, the odd-shaped pieces would suffer damage.

The method of loading was strictly up to the ingenuity of the individual. Since the carts were not made to fit the parts, the parts had to be dovetailed as well as possible to fit the carts. And in such cases as the exhaust system parts for the Continental tank engines, bulky section had to be placed on the top of the carts, overhanging on both sides.

Modern design, as applied by the mechanical design group of Ryan's Plant Engineering Department, has come to the rescue. Custom-tailored racks in various shapes, but all so compactly arranged that a minimum of space is needed to accommodate a maximum of parts, have been produced by the mechanical maintenance department to specifications of plant engineering.

Some, such as those for the General Electric J-47 engine struts, have a "bird-cage" appearance. On others are rubber-encased supporting hooks that give them a similarity to clothes-trees.

The general principle is that each piece has its own allotted compartment to prevent surfaces from rubbing against each other. But the separation is performed with amazing space economy. Thus, one of the "bird cages" can hold 204 J-47 struts, several times more than a "tote" cart which occupies almost as much actual floor space.

And as for ease of handling, "tote" carts are "man-handled," while the newly designed racks can be pulled, several at a time, by a small conveying truck to inspection, shipping and final packing.

Modern design, as exemplified by bright, orange-colored racks neatly loaded with metal products, is helping speed output through more efficient materials handling at Ryan Aeronautical Company.

Continuous Belt Conveyor Shrinks Space

WITH A NEW, MOTORIZED assembly line technique, unique in the exhaust systems manufacturing industry, Ryan product experts have expanded output and cut factory space requirements in half.

Conceived around a continuous belt conveyor system, the new fabrication line is geared to turn out thousands of exhaust manifolds for the Continental model 1790 engines which power the M-46 and M-47 General Patton tanks. Stretching 140 feet through the heart of the Ryan plant, the motorized belt has neatly solved two problems which perplexed factory supervisors.

Squeezed between expanding production requirements, requested by Continental, and stepped up orders from other important customers, Ryan factory supervisors were forced to dig for ideas. Factory floor space was the problem—it was disappearing in a maze of new machines and assembly lines.

The solution to the dilemma was the joint product of Robert Clark, assistant production manager; Ray Ortiz, manifold production superintendent, and Floyd Bennett, manifold final assembly foreman. They decided on use of a continuous belt conveyor system similar to that used in the food packaging industry, with the 1790 program streamlined to fit straight-line assembly methods. This was a distinct departure from standard practice in the industry.

Since its inception, exhaust systems manufacturing has been considered to be more like the garment making industry than any other, because both produce innumerable models and sizes of the product with the same equipment. Consequently, Ryan production machines are arranged along logical parts "flow" lines and the various components are threaded through them in the fabrication process. Machines are placed so that trucks can bring the parts to them and the pathways of the different parts may be widely divergent because of the varying requirements of each model.

With a straight-line assembly system, a new approach had to be visualized. The machines, tools and jigs had to be carefully positioned along the line. Exact number and spacing of these elements had to be coordinated with the conveyor line speed. Careful timing of each oper-

Fig. 7. Manifolds for Continental engines are picked up at this end of production "pipeline" after being spotwelded together at jigs which are conveniently placed next to line

Fig. 8. Arc welders flank moving production line in booths which are curtained to protect other employees. Arc welding is used to attach flange to the Continental engine manifold

Fig. 9. Near end of production line exhaust system sections have been assembled, welded, sandblasted, sized and inspected

Fig. 10. Conveyor line spills sections of Continental engine into bins from which they are taken to build engine sets

ation was demanded. The 1790 exhaust manifold consists of five separate and differing components: an outlet section, two mid-sections and two end-sections. Each requires different operations performed upon it but all must flow along the same production line at uniform speed.

Eighteen separate tasks, such as assembly, welding, sandblasting, sizing, facing and inspection, must be performed along the line and no back-tracking of the parts is allowed. Smooth dovetailing of these operations had to be planned to insure that the prescribed proportions of each manifold would arrive at the end of the conveyor line. Engineering and tooling changes were worked out to permit the parts to be made under these conditions.

As soon as the new assembly line rolled into action it became apparent that it was the answer. Production of 1790 Continental manifolds has been substantially increased and the space occupied by the entire line is only half of that which would have been required by the former method of fabrication.

Key function of the motorized belt is to bring the parts within easy reach of every employee in a uniform flow. This relieves him from having to move about to get and dispatch parts, load conveyor trucks and wait for others to bring components to him. This saves his time and energy. It also permits the telescoping of all machines into minimum space because room for truck delivery is no longer required.

Parts are maintained in top condition as they are fabricated because they are transported upon a rubber-impregnated belt. Time required to orient experienced employees to the assembly pattern is decreased from two hours to only thirty minutes because the complete sequence of operations is laid out along a straight line which can be quickly understood by a newcomer.

Control of the parts and fabrication rates is simplified because the foreman can see at a glance where all components are and determine causes for shortages or delays.

An added premium resulting from the installation of the new system is the approval of the employees who work on the line. Generally, they like the new method and welcome the benefits which it brings to them in facilitating their work.

The belt is a continuous loop, 280 ft long and 22 in. wide, made of rubber-impregnated canvas. It is suspended over steel rollers along the 140-ft assembly line and wound around steel, rubber-coated drums at each extremity. Power is supplied by a variable speed motor drive which can be adjusted to provide belt speeds running from a few inches to several feet per minute. A magnetic push-button starter actuates the system.

Ryan specified the addition of a steel shelf which is located on each side of the belt so that parts can be removed from the conveyor without creating a storage problem at any station.

More Fuel Tanks Shipped Now Through Special Handling, Special Racks

THE LARGEST EXTERNAL wing fuel tanks ever built for aircraft are being delivered from the Ryan Aeronautical Company's San Diego plant in a steady, ever-increasing flow—thanks in part to a unique, specially designed transportation system.

Today, six tanks can be shipped simultaneously, where only two were sent before. The material handling system involves monorails, jib cranes, shipping racks, transport dollies, tracks, a special loading dock and unusually large freight cars.

Shipping two crated tanks to an ordinary automobile box car was unsatisfactory, not only because of failure to utilize the space fully, but because of the uncertain supply of this type of railroad equipment.

Twenty-two shipping racks—two to a car—were built. Each consists of three rubber-lined cradles to support the tanks in triangular formation, two tanks side by side below and a third at the apex between and above them. Rails on which the racks can move were installed inside each of the eleven cars.

At Ryan, a special concrete ramp and loading dock, 125 ft long and 12 ft wide, with a 28-ft "L" parallel with the Ryan railroad siding was constructed. On this dock, rails were laid to control the movement of the racks up the ramp to the main dock.

A large transport dolly was built by Ryan to carry the racks from paint shop to shipping dock across black-top asphalt areas that might otherwise be damaged by their grooved, swiveling casters.

Overhead monorails were installed in the paint shop and an adjoining area where the tanks are kept 24 hours while drying.

From the monorails, the tanks begin their journey. A jib crane lowers each tank to a weighing dolly placed on a scale at the end of the monorail line. After the exact weight is stenciled on the top fairing of the tank, the same jib crane transfers it from the weighing dolly to one of the cradles in a specially built rack.

The transporting dolly is a low underslung carriage with adjustable ramp rails extending to the rear. Up this adjustable ramp the loaded shipping rack, weighing approximately 3300 lb, is pulled onto the carriage.

A truck is hitched to the transporting dolly and tows it to the loading dock. Here, the shipping rack slides off the dolly and the grooved casters pick up an inverted angle rail on which it is pulled up the ramp by means of a cable operated by a geared winch.

When the shipping rack reaches the "L" portion of the dock, the rack is resting on a transfer "car" that carries it sidewise to alignment with angle rails connecting with the rails inside the special railroad car.

From there the shipping rack again moves forward on inverted angle rails leading into the box car.

Clearances are extremely narrow. As the shipping rack enters the car, there is only 2½ in. of space on each side and the top of the doorway.

Inside the rail car, each of the two shipping racks is bolted down, leaving 2 in. clearance between the tanks and at each end of the car.

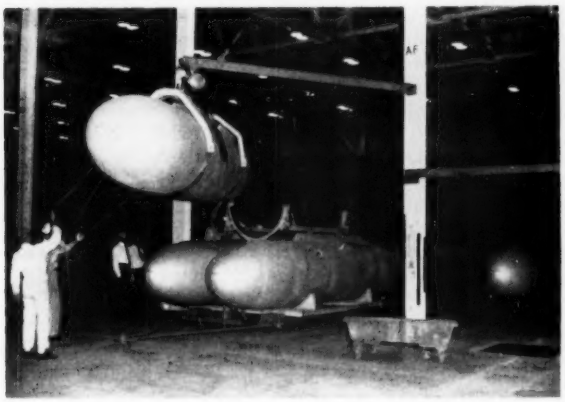


Fig. 11. First step in shipping external fuel tanks is lowering cells into rubber-lined cradles of special shipping racks

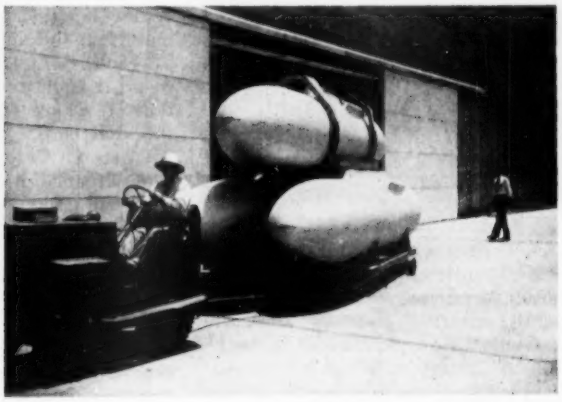


Fig. 12. Next step in transporting the tanks is to haul them to the railroad siding by trucks which attach to special racks

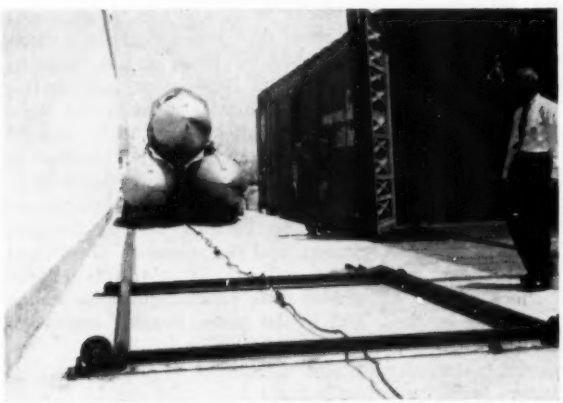


Fig. 13. Loading of cars is accomplished by cable-and-winch assembly with rolling track. Shipping rack is pulled up ramp and then rolled sideways to front of special car

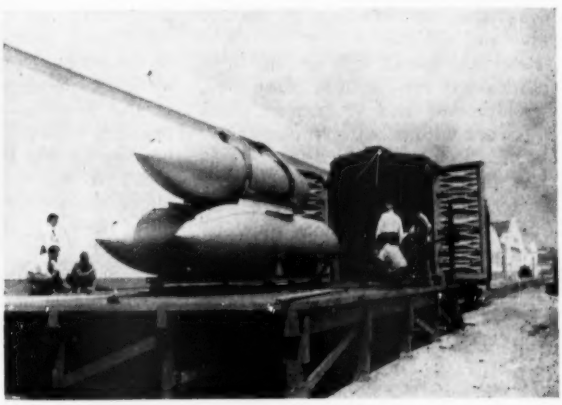


Fig. 14. Equipped with end doors, these new railroad cars can take six big fuel tanks instead of the two which was formerly limit of capacity of old type railroad freight cars

The How and When of WATER WELL ACIDIZING

Acidizing, says the author, will not help a well where the table has dropped or where the pump impeller is worn. But, when investigation shows that there is a clogged screen or clogged formation acidizing can help a lot to restore proper flow . . . Outline procedures in acidizing . . . Precautions to take

By W. M. ZINGG, Development Engineer, Dowell Incorporated

RESEARCH AND PRACTICAL experience gained in the acidizing of water wells during recent years have led to the adoption of more effective methods and acid solvents. The improvement in methods is largely confined to the increased importance given to surging and backwashing the formation following acid treatment; the improved solvents containing chemical agents to control the swelling of certain clays and silicates.

The purpose of this article is to comprehensively discuss these new developments and to furnish plant engineers with a better understanding of water well acidizing.

As an introduction to this subject, the writer wishes to recognize that there are probably as many opinions as to the proper methods of acidizing a water well as there are individuals who have used acid. There is good reason for these various opinions as they stem from conditions wherein common sense, rather than definite facts, prevails. These conditions are inherent to water wells where conclusions as to the remedial action to be taken must be arrived at by observations and study of data available only from the surface.

Further study of this situation reveals that this wide variation lies mainly in the details of application. The end result seems to be common to all, i.e., the removal of obstructions blocking entry of water into the well bore.

When Is Acidizing Applicable? The screened well producing from sand and gravel formations predominates among our many industrial areas and plant engineers are faced with a never-ending struggle to keep them producing enough water to meet the needs of their plants.

Acid can correct neither a decrease in the water table nor worn pump impellers. In arriving at a decision to acidize a well, the plant engineer should satisfy himself that such items as these are not at fault. The worthiness of the pump may be considered first with a few simple observations. Does the pump deliver its design pressure at the rated rpm? Is the impeller clearance adjusted properly? Could failure of pump to operate be due to a hole in the tail pipe? A hole in the water column above the pump may cause part or all of the water to by-pass back into the well.

When convinced that these are not to blame and a check confirms that water is still available in the formation, it is safe to conclude that the water simply cannot come into the well. This conclusion is further confirmed if the loss in production has been gradual and accompanied by an ever increasing drawdown. It is obvious that the water is blocked by either a plugged screen or formation. At this point the plant engineer must decide whether to drill in a new location or attempt a chemical or workover treatment of the existing well. Many factors naturally enter into this decision, but when diagnosis shows that the loss in production is due to a clogged screen or formation, acidizing is a treatment economical enough to justify its use rather than abandoning the well.

Plugged Screens, Consolidated Formations. Perhaps first to be discussed are the well conditions that can ordinarily be successfully remedied with acid. These are generally recognized as 1—corrosion products and scale on the screen, formation face and pump column internals; 2—consolidation of the formation surrounding the screen.

Water wells are completed in all types of formations including those composed of loose sands, gravels, sandstones, limestones and dolomites. In numerous cases the wells produce satisfactory volumes of water on completion but decline as they get older. These reductions in flow are frequently due to the deposition of various scales on the screen, and the presence of silt and other extraneous materials in the gravel pack surrounding the screen and in the water bearing formation close to the well.[1]

The mechanics of these plugging actions are relatively simple. Water, in flowing through the earth, dissolves certain metals such as iron, aluminum, calcium and magnesium.

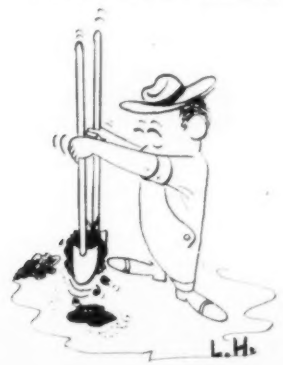
Dissolved gases such as carbon and sulphur dioxide are also present and when these are released by a decrease in pressure resulting from the low hydrostatic head at the well they combine with the metals to precipitate oxide, sulphide and carbonate compounds on the screen and formation face and even in the flow channels of the formation surrounding the well bore. This is especially true when a well is operated with an excessive drawdown. Quite frequently we find that the screen has been exposed and under this condition, the surface in contact with air scales completely in a very short time.

Fine sand and silt will also bridge and cement in the screen slots and formation, effectively walling up the water channels. This condition may be due to a number of causes; the nature of the formation, over-pumping or by poor development of the well when drilled. Cases are known where this consolidation has been evidenced at distances ranging from a few inches to as much as 25 ft from the well bore.

Plugging may also result from bacterial growths. This condition is not too prevalent but when it exists, it should be recognized that acid is not effective. Some form of chlorination is generally effective in killing this type material. Following this, acidizing may be in order to bring the well in at an increased capacity.

Chemicals and Auxiliary Agents. It is difficult to discuss chemicals without giving consideration to the various formations and conditions encountered in acidizing. Basically, however, inhibited hydrochloric acid is used along with auxiliary agents that give special properties and provide better results than when acid is used alone.

Hydrochloric acid has several distinct advantages over other mineral acids which could be used for this purpose. Among these advantages are its relative ease of handling and



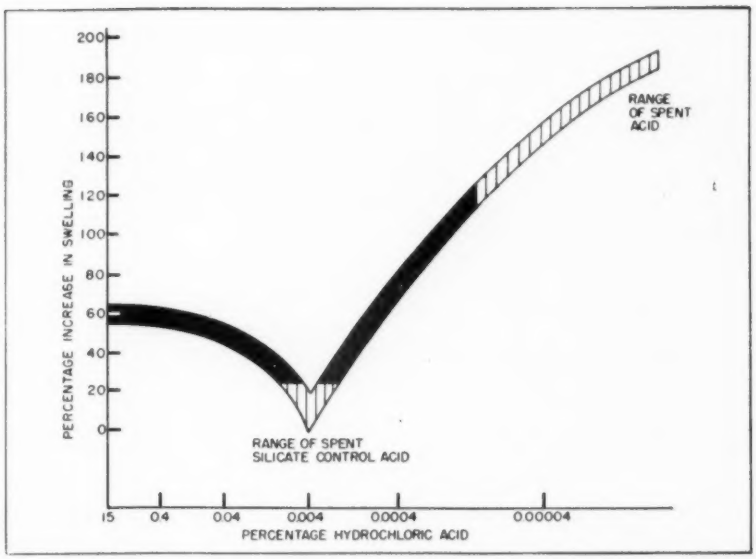


Fig. 1. The swelling of silicate particles in contact with an acid can be controlled

inhibition, the solubility of its reaction products and its compatability with various chemical additive agents.

Although theoretically a definite amount of acid should dissolve a given amount of scale, the low temperatures encountered in water wells and the large amount of water present, which tends to dilute the acid, require a much larger amount of acid than would appear from the calculation. The volume of acid should be sufficient so that the acid will not become completely spent in dissolving the deposits. Spent acid can become so heavily loaded with dissolved and suspended matter that it requires considerable time to pump it from the well, thus delaying any increase in production which the acidizing might achieve.

Maintain Concentration

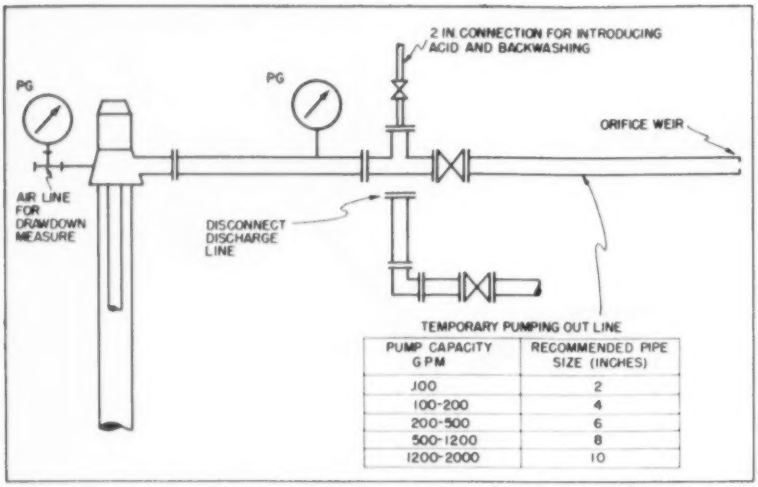
Adequate concentration or strength of the acid must be maintained in order for it to react with the deposits after it has been diluted with the water in the well bore and under the low temperatures present. Carbonates and sulphides will usually react with low concentrations but the oxides generally require much higher concentrations.

Use of Inhibitors. Raw hydrochloric acid attacks metals, particularly iron and steel. In order to prevent this attack on metals encountered in well equipment, an inhibitor should be used. This is a chemical agent that, when added to acid, reduces the attack on the metals to a negligible degree. In wells producing water for potable purposes, special non-toxic inhibitors that leave no objectionable taste or odor must be used.

Stabilizing agents have found considerable use in water well acidizing. Scales containing iron dissolve readily in acid, but as the acid becomes spent these soluble reaction products precipitate as voluminous iron hydroxide, with remarkable plugging characteristics. This phenomenon can be avoided by the use of stabilizing agents which prevent the precipitation of the iron, even if the acid should become completely neutralized.[2]

Low surface tension of the solvent is obtained through the use of wetting and emulsion agents. These permit greater penetration of the acid into the voids and more intimate contact with the deposits, resulting in better and more complete chemical reaction. This property is most important when fine sand, oil or bacteria are present. The wetting agent allows the acid to penetrate such materials and by dissolving the binding inorganic deposits, to bring about the disintegration and removal of such insoluble elements. This property is also of major importance in that it permits easier recovery and pumping out of the viscous spent acid, following the treatment.

Silicate swelling control has been mentioned earlier. In the acidizing of oil wells it is recognized that certain clay or bentonitic materials found in some formations are insoluble in hydrochloric acid In addition, these silicate minerals tend to swell in the presence of acid, the extent of their enlargement depending upon a number of factors: their location within the formation; ab-



PUMP CAPACITY G P M	RECOMMENDED PIPE SIZE (INCHES)
100	2
100-200	4
200-500	6
500-1200	8
1200-2000	10

Fig. 2. Diagrammatic representation of well hook-up during acidizing treatment

sorption of water; base exchange; and the effect of the pH change brought about by neutralization of the acid. Since the swelling of these clays can cause reduction in the permeability of an acidized formation, it is desirable in the treatment of formations containing such silicate materials, to employ a silicate control agent in the acid which, in effect, freezes the clay particles at their minimum volume. The value of this agent is shown in Fig. 1.[2]

Methods Of Acidizing. It is necessary to determine first the volume of acid to be used on a well. Experience shows that a minimum volume of 15 per cent acid, equivalent to 5 times the screen volume, is usually required to obtain the expected results. The volume and strength of the acid are also influenced by the solubility of the formation being acidized. Sandstone, chert or similar formations, where the ratio of soluble calcareous material to insoluble material is low, generally require large volumes of weak acid, as the purpose of the acidizing is primarily aimed at removing the calcareous material.

Choice of Method

Fundamentally there are two methods of acidizing screened wells: 1—treatments performed with the pump and water column pulled from the well and, 2—treatments made with the pump and water column installed in operating condition. In the first case, acid is introduced through a temporary line extending into the screen area of the well. The solution may be allowed to stand for several hours or overnight, or it may be agitated with air or a surge plunger. The spent acid is then removed with a bailer, or a pump is installed and the spent solution pumped from the well.

The second method requires that the regular pump unit be installed in operating condition, as the pump will be used in conjunction with the acidizing operation. The treatment is designed, not only to clean obstructions from the screen and formation, but also to redevelop the formation surrounding the screen. The well set-up used with this method is detailed in Fig. 2 and the treating procedure usually employed is as follows:

1. A sufficient quantity of the acid, in concentrated form, is pumped into the well through the pump column, to give a 12 to 13 per cent concentration of acid, after dilution by the water in the well bore. This is commonly referred to as the "cleanup shot." Its purpose is to remove the more readily soluble carbonate and sulphide compounds, along with any iron oxide encrusted in the pump column and on the screen. This acid solution is allowed to stand in the well for a period of 2 to 3 hours. During this time, the well is surged every 30 minutes. This is accomplished by running the pump just long enough to lift the acid to the surface and then stopping the pump allowing the fluid to fall back into the well. This produces a scrubbing action up and down the screen, as well as a lateral motion through the screen that helps to clean up the formation face and the screen slots.

2. At the conclusion of this soaking period, the well is operated until the water runs white. If during this first cleanup shot the acid spends very rapidly, say in an hour or so, and if there is evidence of much reaction foam or gas, it is then felt that the screen must be very dirty and a second cleanup shot is used, much after the pattern of the first. The entire purpose of the cleanup shot is to completely remove the deposits from the internal surfaces of the well, so that they will not be carried as reaction products into the formation.

3. The remainder of the acid, amounting to approximately 75 per cent of the acid used in a treatment, and known as "the formation shot," is diluted to 15 per cent and pumped down the column. It is then displaced into the formation with a volume of water roughly equivalent to that of the screen.

4. The spent acid is then pumped from the well and the well pumped for several hours before turning back into the main.

Importance Of Backwashing and Surging. As stated above, the well should be pumped for an extended period even after the pH has returned to normal, and the water is clean. Many failures are believed to be due to insufficient pumping following the treatment. During this period, removal of loosened material is made much more effective by surging or backwashing.

What Happens

There seems little doubt that a gravel treated well is a better producer regardless of how it is conditioned; whether by the double casing method, air, through pilot holes or by natural development with the pump alone. The result, by any of these methods, is to establish a stabilized bed of coarse, uniform-sized particles around the screen which will yield and hold more water than would a mixture of sand and gravel. Initially, the well is ideal for maximum water production, however, in time the silt and fine sand behind the gravel are pulled in again to occupy the voids in the coarse gravel, and to bridge and cement on the screen and in the formation. This is probably the condition of the formation at the time the well is acidized. Assuming that the acid successfully dissolved the oxide, sulphide, and carbonate binding materials, all that remains to be done is to work the smaller particles out of the gravel, immediately surrounding the screen.

Three Methods Of Surging. Surging, or "rawhiding" as the practice is commonly called, consists of starting and stopping the pump intermittently. There are three different methods of operating the pumps in order to produce different effects:[3]

1. Operate the pump at full ca-

pacity until the water has reached its greatest possible drawdown. Stop pump and allow water to recede out of the pump column. Repeat until well shows no further improvement. This is the mildest method of rawhiding, but also is the least severe on the pump. The greatest possible extremes in pressure heads are obtained and a good amount of agitation results when the water at high head rushes back into the well which is in a state of reduced head.

2. Pump the well at full capacity until it has reached its greatest drawdown; however, instead of letting the well recover its full static level, continue to start and stop the pump in short intervals. This keeps the well in a state of reduced head and provides frequent agitation of the screen. The changes from start to stop are accompanied by changes in direction of flow through the screen. This procedure is a more forceful method of developing the water bearing formation.

3. Pump the well until water discharges at the surface, then stop pump and allow water to recede. No attempt is made to draw the water level as low as possible or to hold it at a low level. This method causes agitation in the formation by "jerking" the water in the flow channels.

Backwashing Rate

Good results can be achieved by washing backwards through the formation. This may be done either by tying in a 2½ in. fire-hose water supply, through the pump, or by pulling the clapper from the check valve and admitting water down the pump column from other wells, if they are on a common manifold.

A word of caution here is that no well should be backwashed at a greater rate than it can give up water. To do so might cause the water to go up the outside of the casing, breaking up overlying layers of clay, fine sand, etc., which later would be drawn down to block the outside of the screen. Channeling the outside of the casing also may admit surface waters, resulting in the contamination of the well.

Care must also be taken not to go at this work too fast, because of the danger of sand locking the pump. Pumping should be started by throttling the discharge valve so that not too much sand is drawn all at once into the pump column. Rawhiding should not be commenced until the well has gradually been increased to its full capacity, or until it is felt that most of the sediment has been removed.

In practice any one or a combination of these methods may be used, depending on the response of the well during acidizing. Generally, however, the acid shots are pumped from the well, first at a reduced rate, then gradually increasing the rate to full capacity. This is continued, either until the water cleans up or production falls off, which ever may come first.

At this point the pump should be stopped until the well regains most of its static head. The pump is then started and stopped about three times. This produces agitation and rapid changes in the pressure head of the well. The pump is then started and allowed to pump continuously until another drop back in production is noted. This procedure is repeated as many times as necessary until the well shows no sign of further improvement. At this point, if a fire hose connection is available, the well is then backwashed for one minute with the full capacity of the fire hose. On larger wells, having 20 to 24 in. screens, this may be increased to two minutes.

To perform this type of treatment properly, it is necessary to have a discharge pressure gauge, an orifice meter or some other satisfactory method of measuring production rate and an air line to record drawdown. By observing the data obtained by these three instruments, it is possible to follow the course of the treatment and determine what the next step is to be.

Case Histories. An actual water well treatment will be described in order to illustrate the above theories and observations, and show how they work out in practice. Figure 3 represents the production and drawdown curve of this well before, during and after acidizing. This well was drilled into a river basin sand and gravel formation, with overlying silt and fine sand layers. The well was cased with 90 ft of 16 in. casing and screened with 30 ft of 14 in. bronze screen. Pumping equipment consisted of an electric turbine pump, and an 8 in. pump column, with the tail pipe set 5 ft above the top of the screen.

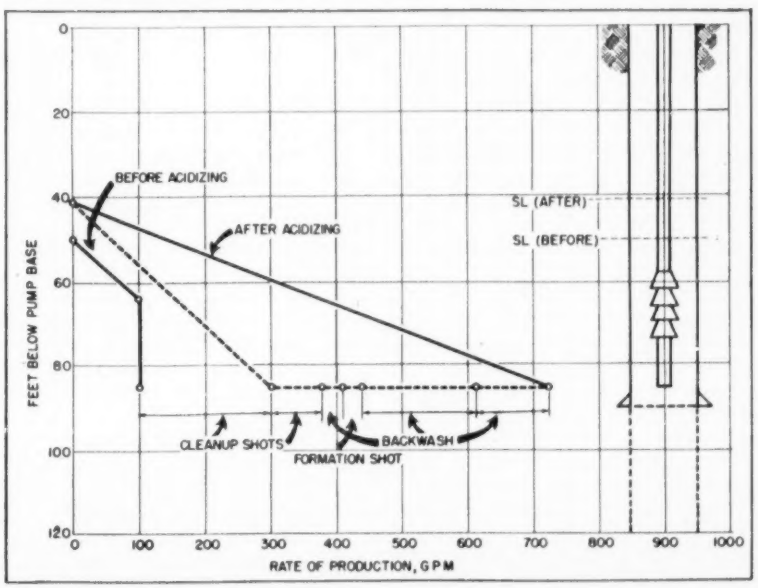
Prior to acidizing, the well would pump 100 gpm with a 14 ft drawdown. Upon opening the discharge valve a slight additional turn, the water would pull clear down and break the suction.

Static Level

A clean-up shot of 250 gal of acid was applied down the pump column. In 30 minutes time, titration of the acid during surging indicated the acid was nearly spent. Production tests made while pumping out the spent solution showed a 200 gpm increase. Of interest also is the fact that the apparent static level had raised 9 ft. This is not an unusual occurrence during acidizing. Many wells are known to take considerable time, sometimes hours or days, to recover the last few feet of static level.

It is probable that the clean up stage, in opening up the screen slots, enables the well to recover its true static level almost immediately. Very little change in the static level occurs during the rest of the treatment.

Fig. 3. Graph showing increase in production obtained by acid treating water well



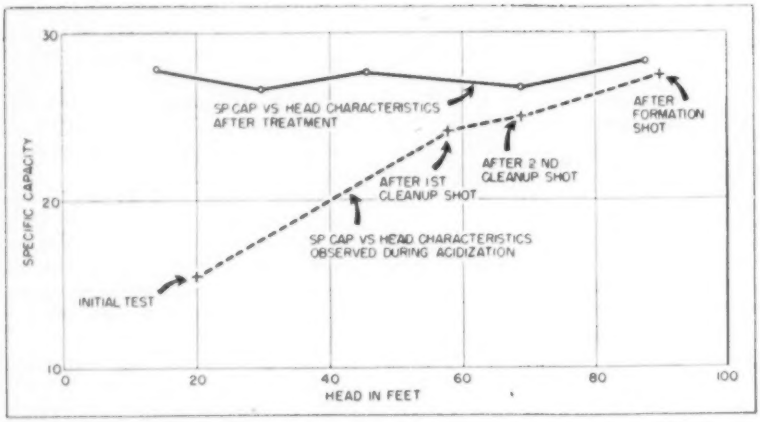


Fig. 4. Graph showing increase in specific capacity of well following acidizing

Since in this particular case the first cleanup shot reacted so completely in such a short time, it was obvious that a considerable amount of readily reacting deposits were present in the well column and screen so a second cleanup shot was applied. After an hour of soaking and surging, the strength of the acid was holding up well and it was decided that most of the benefit of this stage had been obtained. Upon pumping out the acid, tests showed another increase of 80 gpm.

Results of Acidizing

At this point the well was backwashed with 2½ in. fire hose and after pumping, an additional 30 gpm increase was obtained. One thousand gallons of acid was then pumped into the well and displaced through the screen into the formation. The well was surged intermittently until the acid reached a low concentration, after which the well was produced until the water ran white. The measured increase was small, amounting to only 30 gpm additional. This condition is normal, however, as very little pick-up occurs during the formation stage until the development work has been started on the well, after the acid has been removed.

The well was next backwashed one minute, and rawhided with the pump. Sand, small gravel, red rust and silt were removed for a time, after which the water again cleared. This resulted in a production increase of 170 gpm. This procedure was repeated again, resulting in an additional increase of 115 gpm.

This acidizing treatment resulted in an over-all production increase of from 100 gpm to 725 gpm. The well was then placed back on the main at a 550 gpm rate, so as to maintain a pumping level safely above the top of the screen. At least 50 per cent of the production increase on this well was obtained by development of the formation to remove fines loosened by the acid.

Figure 4 represents the results of an acidizing treatment on another water well, expressed in terms of specific capacity. This drawing gives a graphic representation of the amount of useful production that may be obtained from a well at different pressure heads. The dotted curve shows the increase in specific capacity as observed during the acidizing treatment. Unlike the well discussed above, approximately 75 per cent of the increase was obtained from the cleanup shots, indicating that the problem was, in this case, primarily that of a plugged screen.

Precautions In Acidizing. On many occasions it will be found that adjacent wells are in operation during the acidizing of a well and in some cases communication may exist. If it is possible, any adjacent wells, particularly within a 100 ft radius of the well being acidized, should be shut down during the treatment. This is recommended for two reasons. First, the acid may drift to the operating well and be discharged into the main, where its presence in the plant water may be detrimental (as in food plants or critical chemical processes). Secondly, if communication exists, the acid may be pulled away immediately from the well being acidized, consequently with little benefit to that well.

When acid reacts with carbonate deposits, an appreciable amount of carbon dioxide is liberated as a gas which, although not toxic, can cause asphyxiation if allowed to accumulate in a poorly ventilated well house or pit. A more common hazard is that this gas may generate a foam that will overflow the casing to submerge or damage nearby equipment at the well site.

Hydrogen sulphide is also commonly liberated as a gas, during acidizing. This is a toxic compound and should not be overlooked. Properly trained personnel can safely conduct an acidizing treatment in the presence of this gas, provided adequate ventilation precautions are observed.

Other Applications. In many instances, wells are completed in formations that do not yield sufficient amounts of water due to low permeability of the rock or improper well completion method. If it develops that the cause of the low production rate is due to low initial permeability of the water bearing formation, tests should be made on samples of the formation to determine the effectiveness of an acidizing treatment. If the low production rate is caused by mudding-up of the face due to the completion method, a large increase may be obtained by a chemical treatment using chemicals capable of dissolving and disintegrating the mud sheath, as well as any mud that may have entered the formation.

Stimulating Methods

Deep wells completed into dolomite or sandstone formations can be treated to make these formations give up more water. Other well stimulation methods may yield even better results, in such cases. These include perforating, fracturing or combinations of these methods with acidizing. Successful treatments have been made, whereby fracturing of a consolidated formation was accomplished by pumping in a viscous solution containing sand. This procedure requires high injection pressures, in order to lift the overburden and create new flow channels to the well bore.

The sand serves to prop open the fractures after the pressure is released. The viscous solution is removed by pumping after dilution with the formation water has taken place. Operators having deep wells that are not producing at full capacity, may find the above described methods are worth investigating.

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MAINTENANCE COSTS of Industrial Lighting Systems

By **LEONARD V. JAMES**, Illuminating Engineering Consultant

PROBABLY THE most economic fact about the maintenance of lighting systems is the setting up of an adequate plan and schedule. Good maintenance can be shown to be good economy; poor maintenance —to save that expense—poor economy.

What influence does the maintenance factor (MF) have on lighting design? Let us assume that a new system is being planned and the lighting adviser inquires about the maintenance arrangements. The answers give him reason to believe that the average maintained value of lighting level in service will be 70 per cent of the initial level, and he plans accordingly. He calls this 70 per cent the maintenance factor —MF. Or perhaps the answer he receives indicates an attitude and lack of planning which convince him he cannot depend on better than a 50 per cent MF.

How to Apply MF

The former figure of 70 per cent is very good, but can readily be obtained with the strict operation of a good maintenance program. The 50 per cent figure is low but unfortunately is found in many poorly maintained plants and even in some offices.

In designing the system, the engineer will first ascertain what maintained foot-candle level is desired. We will be on the conservative side and select 35 ft-c. Lamps will depreciate with age, fixture surfaces will become soiled and the average maintained lighting level will fall off. The amount of this depreciation is indicated by the maintenance factor. So, initially, when the lamps are new and all surfaces are clean, the level will be higher than that required—50 ft-c if the MF is to be 70 per cent, 70 ft-c if the MF is to be 50 per cent.

The designer will now proceed to plan a system that will deliver one of these initial lighting levels, under new and clean conditions, so the average maintained level of 35 ft-c will be available later.

In the July issue of PLANT ENGINEERING, the cost of lighting was analyzed. This cost was found to be a function of the number of fixtures and lamps and of the connected load in kilowatts, for any given period of time. If the periods between cleanings were the same in both cases, the annual cost of light for an installation planned to deliver 70 ft-c initially would be 40 per cent more than that for one planned to deliver 50 ft-c initially, both for the same ultimate result. This difference is due to the different maintenance factors.

Presented with these facts, management will be tempted to promise the 70 per cent maintenance, so as to benefit continuously by the 40 per cent difference in the cost of light. The saving is not altogether clear, since part of it must be allocated to the better maintenance operation. It is now, however, at least possible to plan a cleaning operation more intelligently, knowing how much additional money will be available for it. As a rule, this extra expense will be much less than the savings mentioned.

Once the matter of the initial footcandles is decided and the lighting equipment installed accordingly, the maintenance schedule as set up must be adhered to. Otherwise the penalty will be a lower lighting level in service than that considered to be the practical minimum.

Cleaning Expense

When it comes to planning the expense for cleaning the lighting equipment, experience is the best guide. Rate of pay for workmen, type and accessibility of the fixtures, plant atmospheric conditions, etc., are important and all vary greatly from one place to another. The plant engineer, in the plant in question, is in the best position to judge these details and to advise in setting up the program.

As has been mentioned in a previous article, lighting maintenance contractors are now available in many industrial centers. They are experienced in this work and will contract to keep the equipment clean and in repair and also to replace burned-out lamps, on a group replacement basis. In January of this year, a group of these contractors met in Cleveland and organized the Associated Lighting Maintenance Companies of Amer-

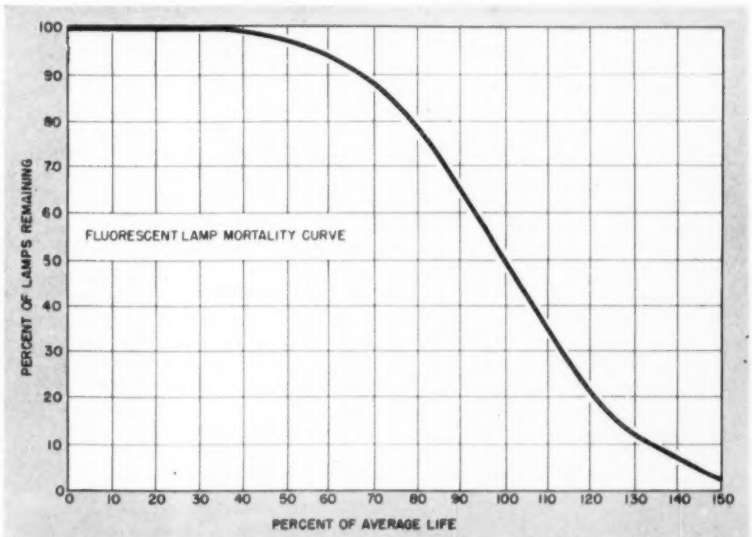


Fig. 1. This typical lamp "mortality curve" shows the number of lamps remaining in a life test under normal conditions. At 80 per cent of average life, 20 per cent of lamps will have failed and rest will be delivering a reduced light output

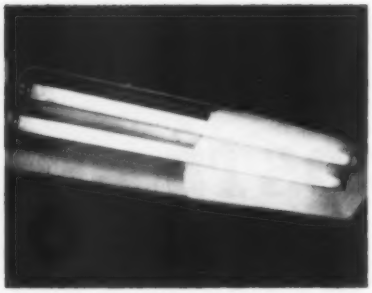


Fig. 2. The importance of cleaning fixtures can be seen from increased reflection from cleaned portion of reflector compared to the soiled section

ica.[1] In some instances, such companies have contracted to install, rent and maintain an installation, the details of which have been agreed upon with the plant authorities.

Cleaning the lighting equipment is usually the most simple phase of the maintenance operation to plan, as the timing need not be accurate. A large crew may be diverted from other tasks for the purpose, at approximately the time decided upon or when lightmeter readings indicate the need. Perhaps a better plan is to adjust the size of the crew—permanently assigned to this task—so that it can just complete a round in the period selected between cleanings of individual fixtures. In many cases, occasional washing of the fixtures may suffice, with dustings between times. The more thorough cleanings could then be made when the lamps are replaced, particularly if this is on a group replacement basis. Staggering departments for replacement and washing can even out the periods.

Planning the replacement of lamps is more particular, as the need at a special time is evident. Outages are unsightly and a number of these in a department will result in a loss of productive light. This replacement is a nuisance as well as an expense, especially if it is always done individually as the lamps burn out. This expense and nuisance is accentuated when a crane or other equipment is taken from production for the task.

It has been to reduce this expense and inconvenience that "group replacement" of lamps was first considered and has now become established as a rather definite procedure. Rated lamp life, as given by the manufacturer, is average life (under normal operating conditions). Despite all the efforts of the manufacturers to secure complete uniformity, some lamps will fail earlier than this life period, some later. See lamp mortality curve, Fig. 1.

It is interesting that, in general, about 20 per cent of the lamps will have burned out in the first 80 per cent of average life. The generally accepted plan, therefore, is to install new lamps throughout an area in which group replacement is to be established. One-fifth as many more lamps are then set aside as a reserve stock, to be used for early replacements. When this reserve is exhausted, 80 per cent of the normal burning life of all in the system is indicated and all of the lamps are again replaced, and another reserve of 20 per cent are set aside.

The economy in this operation is determined by comparing the loss, in purchased lamp life, against the savings due to lower replacement

[1] Edward I. Creed, C & S Lighting Maintenance Co., 6116½ St. Clair Ave., Cleveland 3, Ohio, is secretary of this association and information about its members can be secured from him.

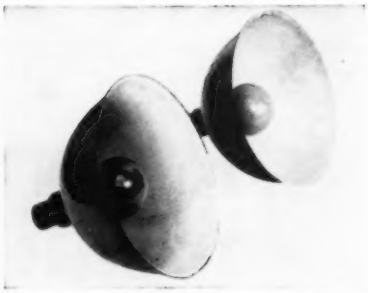


Fig. 3. These two reflectors were operated under identical conditions. Reflector at right is ventilated; darkened reflector at the left is not ventilated

expense and less interference with productive work. With reference to the loss, since the short-life lamps have been removed the average over-all life of those remaining might be 105 per cent of normal. To replace these instead at 80 per cent of normal life is therefore to lose 25 per cent of the value of these lamps.

Against this loss should be balanced the savings in replacement expense. When the complete change is substituted for individual replacements as the outages occur. This savings can well be as much as the total cost of the new lamps and thus several times the loss referred to. This might be true even where the fixtures are easily accessible. It certainly would be true where this is not the case or where equipment must be taken out of productive operation to make the replacement.

A considerable number of the lamps initially replaced may, when renewed, appear to have a fair portion of useful life left in them. In subsequent replacements, there will be very few of these relatively good lamps, as they would be a part only

Fig. 4. Vacuum cleaner is used to take off the loose dirt before it has a chance to adhere to the surface of the fixture

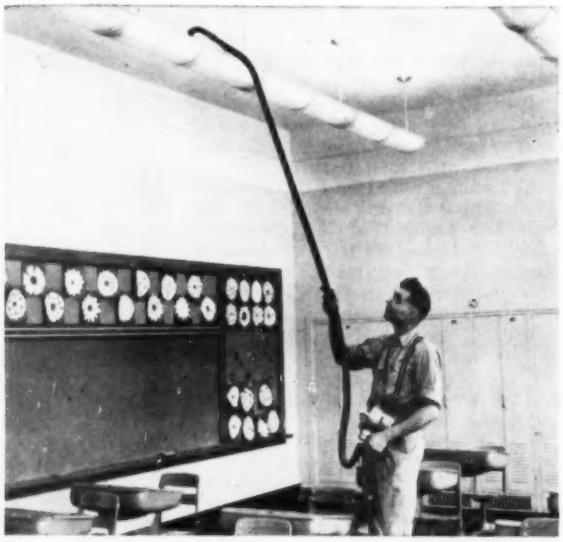


Fig. 5. A blower is used in this classroom to remove loose dust particles from the indirect lamp and fixture surfaces

Fig. 6. Lamps (left), or in some cases, entire fixtures (center) can be removed for cleaning, by using the proper extension equipment. Many types of elevated platform devices (right) are available for use by maintenance men, elevating them and their cleaning materials to the fixtures, even while production work in the plant is progressing

of the 20 per cent reserve installed since the last group replacement. Such lamps can be set aside in a special bin and used at locations where the lamps are easily accessible, where group replacement is not practical and where fluorescent lamps are turned off and on infrequently.

It is not too difficult for one with but little experience to learn to select incandescent and fluorescent lamps which have been used but a small part of their normal life span. With both of these lamps, a dark deposit appears on the glass which increases with age[2]. In the incandescent bulbs this deposit is concentrated above the filament, due to gas currents carrying the evaporated tungsten to this part. In the fluorescent tubes, the blackening occurs near the ends, at the cathodes.

It is difficult however to tell, by inexpert observations[3], how long a mercury lamp has been burned. In this case, it has been suggested that the last half of the reserve mercury lamps, to be installed in a group replacement plan, be marked suitably for identification on renewal.

Loss of Light Factors

As has been noted, the light emitted from all lamps decreases with life, due to a deterioration of the filament or cathode and, in some cases, of the gas. The average output varies from about 80 per cent to 90 per cent of the initial value. Of course, lamps which last much longer than their normal life continue to depreciate—such lamps frequently are referred to as "tired old lamps."

By group replacement of lamps at the time they have been burned 80 per cent of their normal life, the average light output is maintained at a value about the normal average. That is all that can be done, maintenance-wise, to counteract light losses due to lamp aging. That is, however, an important improvement.

Soil accumulation of fixture surfaces (including the lamps) reduces the light delivered from that fixture. If the light is to be reflected it must pass through the layer of soil to the reflecting surface and then back through the soil again. If the light is to be transmitted through a fixture part it must pass through the soil on both sides of that part.

The prevention or reduction of this loss due to soil starts when the fixture is selected. Position of the surfaces is important—vertical or near-vertical surfaces collect and hold less dust than do horizontal or near-horizontal surfaces. Less soil will adhere to surfaces that are hard and smooth than to those that are rough or have "breaks" on which the soil can accumulate. Plastic surfaces may accumulate a static electric charge due to dry friction, even of passing air, and this charge would attract dust particles. Cleaning the plastic with a detergent, however, leaves the surface with a conducting film which dissipates any such charge.

Figure 2 indicates the importance of cleaning the fixtures. A careful examination of such a reflector will disclose more soil above the lamps than on the sides. This is due to air currents converging at this point. It would, of course, not be true of open top reflectors.

Figure 3 illustrates the influence of air flow on reflector surfaces when the lamp temperature is such as to stimulate this flow. Air in motion due to the heat of the lamp does not deposit its dust and instead may even tend to sweep the surface clear. The reflector that is ventilated to permit this flow of air will not soil as much.

Fixtures once selected and installed can be kept clean only by reasonably frequent dusting and washing. Where the mounting height is low and the fixtures are open, dusting can frequently be accomplished quickly and easily from the floor. In many cases, where the room is narrow and the rows therefore short, low brightness fluorescent lamps are employed and louvers omitted, even in the office.

Cleaning Fixtures

One picture shows a school room where this was done, Fig. 4, and the fixtures were cleaned frequently with a vacuum cleaner. In another similar room, the janitor found that he could dry mop the fixtures in less time than it took to dust the desks, and he did this once a week. Such maintenance pays.

Figure 5 shows the use of a "reversed" vacuum cleaner, or blower, removing dust from luminous indirect fixtures. The use of such devices might seem extravagant. However, careful consideration on a complete economic basis may indicate that they are just the opposite.

Dusting and washing are less easily

[2] See PLANT ENGINEERING, March, 1953 issue, page 91 and April, 1953 issue, page 106.

[3] A lamp expert determines what part of its normal life a mercury lamp has burned by a microscopic examination of the cathode.

Fig. 7. Disconnect hangers save the maintenance man's time and also avoid the use of equipment which may be needed for other operations in another section of the plant

Photos: Thompson Electric Co.

Fig. 8. Catwalks and a portable winch may be used with the disconnect hanger to lower fixtures for cleaning, or the operator can lower the fixture from a floor location

accomplished in a shop with a high mounting of the fixtures. Numerous devices are available to get at the fixture from the floor, Fig. 6, or catwalks, monorail or regular cranes can be utilized. Some large plants are equipped with a special cable car arrangement for each row of fixtures. Too often, such arrangements have been omitted in planning the building.

Early in the last war, the writer assisted in planning the lighting for a large plant (nearly 30,000 reflectors for two 100-watt fluorescent lamps each), where the building plans contemplated such a facility to get at the fixtures. This facility was eliminated as the building construction progressed. So the maintenance department had to use extension ladders in many places to clean fixtures 30 to 35 ft from the floor. Such situations should be avoided where ever it is possible.

One form of modern tooling for fixture maintenance is the disconnecting and lowering hanger. See Fig. 7.

From the economic standpoint, it should be remembered that this hanger consumes no watts, accumulates no disabling soil and has no replaceable parts. The only expense chargeable to it is the amortization of the first cost (purchase and installation) plus occasional minor repairs. In the July article, this amortization was shown to be within 2 per cent per month, even on a six-year basis. With a probable much greater useful life and with very little maintenance expense, 1 per cent might be more realistic. Against this low charge should be credited the possible savings in manpower required by other cleaning methods, plus the probable better lighting results for everybody.

Cleaning operations are complicated where louvers or diffusing elements are used in fixtures in such a manner that they must be removed to clean the fixtures. The same is true where translucent or cellular false ceilings are installed in offices. Such parts are frequently cleaned by taking them down and dipping them into portable vats of detergent and water.

In many cases, 500-watt and 750-watt incandescent reflector lamps can be used where it is impossible, from a practical economic standpoint, to get at the reflectors to keep them clean. Group replacement of these lamps is obviously highly desirable for best economy.

Those readers who have noted the frequent references in this series of articles to the room surfaces as an important part of the lighting system, will not be surprised to find these surfaces included in this maintenance discussion. Poor reflecting surfaces in the room will reflect no more light than would such poor surfaces in the fixture. Both efficiency and a comfortable brightness environment therefore require that these room surfaces be kept reasonably clean and light in color.

As far as efficiency is concerned, the table shows several "coefficient of utilization" factors for rooms with varying ceiling and wall reflectances. These factors express the percentage of the lamp lumens, in the given fixture type, that will be delivered to the working plane, in a room of the indicated size and surface reflectances. The significant thing here is that a deterioration of the ceiling and wall reflection factors from 70 and 50 per cent respectively, to 50 and 30 per cent or to 30 and 10 per cent, will have the indicated effect on the amount of light delivered in the room. It is obvious that cleaning or repainting these room surfaces becomes an important part of any good lighting maintenance program.

Table shows influence of room size and surfaces on effectiveness of light delivery

COEFFICIENT OF UTILIZATION OF LIGHT*	Types of Fixtures		
	Direct Industrial	Direct Indirect	Semi Indirect
Room Size 15 ft by 18 ft by 10 ft Ceiling			
Ceiling Reflectance 75%, Wall Reflectance 50%	.54	.44	.30
Ceiling Reflectance 50%, Wall Reflectance 30%	.50	.34	.19
Ceiling Reflectance 30%, Wall Reflectance 10%	.47	.29	.12
Room Size 80 ft by 200 ft by 25 ft Ceiling			
Ceiling Reflectance 75%, Wall Reflectance 50%	.69	.54	.39
Ceiling Reflectance 50%, Wall Reflectance 30%	.65	.44	.26
Ceiling Reflectance 30%, Wall Reflectance 10%	.62	.37	.17

* Coefficient of Utilization is the per cent of light produced by the lamps that is delivered to the working plane, before depreciation—new and clean. Soil on fixtures and other surfaces could change the reflectance from one stated condition to another

SAFETY FEATURES OF HYDRAULIC CONTROL CIRCUITS

By H. L. STEWART, Special Engineering, Logansport Machine Co., Inc.

PLANT SAFETY has taken a big stride forward by the introduction of hydraulic equipment to machine tools and other implements of production in the past decade. With the introduction of hydraulic safety measures, the operator, the machine and the workpiece are protected.

Safety programs of some type or another have been installed in nearly all plants. Employers do not want careless employees and employees do not want to work on machines that are not safe. In the earlier days of mass production, it was not uncommon to go into a press room and see any number of workers with one, two, or three fingers missing simply because they happened to have their hands under the die in the press at the wrong time. Employers realize that in order to have good employer-employee relations they must provide machines with maximum protection. Labor unions watch this very carefully in many plants. In fact, work stoppages have resulted from complaints of unsafe machines. Insurance companies also demand safer working conditions.

By the use of hydraulic circuits, safer working conditions are easily accomplished at a very nominal cost. It is only necessary to add a couple of pilot valves and some extra piping to the basic circuit in order to incorporate the safety feature. By choosing the proper controls the operator cannot tie down either of the valves and keep the machine operating. Operators have a tendency, especially if they are working on piecework, to try to find some way of speeding up their production by tampering with controls which usually results in dangerous conditions for the operator.

Safeguarding the Operator

The circuit in Fig. 1 is a good example of a two-hand safety control for a hydraulic press. It would be foolish for an operator to try to tie down either pilot valve, as the press will not repeat its cycle if either valve is tied down. The cycle of the circuit is as follows: the operator places the workpiece into the fixture and shifts handles of both four-way, two-position, spring-return valves, keeping both hands occupied. Oil flows to pilot connection on four-way, spring-return valve No. 4, shifting piston, whereupon oil flows to blind end of coining cylinder No. 8 through ball check of cam-operated speed control valve No. 7.

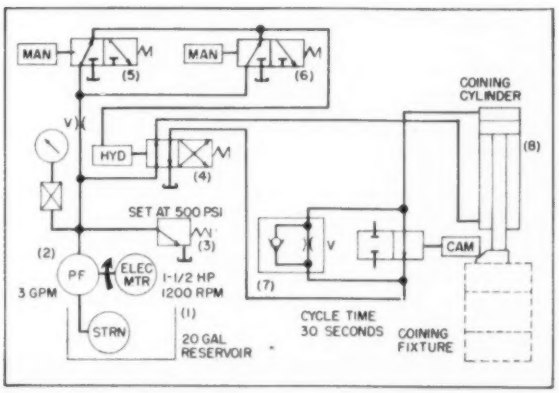


Fig. 1. With two-hand safety control operator has to have both hands on handles before the machine will operate

The piston of fixture cylinder No. 8 advances, performing the operation on the workpiece.

Operator releases his hands from handles of valves No. 5 and No. 6, and valves shift to original position, releasing pilot pressure from valve No. 4. This valve returns to original position and oil pressure flows to rod end of fixture cylinder No. 8, retracting piston at rapid rate until cam on end of piston rod contacts cam roller of cam-operated speed control valve No. 7. Oil flow is then metered through orifice, reducing speed of piston for remainder of stroke.

The operator removes finished workpiece from fixture and inserts new piece for next cycle.

Safety Controls on Large Presses

Four-hand safety controls are of great benefit on large presses where two operators are required. On some of these large machines the operators cannot see each other and do not know if the other operator is ready for the press to be tripped. It is also extremely noisy in a large press room and is often impossible for one operator to hear the other.

With the four-hand safety control system, both operators must place their hands on the controls before the press will operate. If one operator puts his hands on the controls while the other is still adjusting the work, nothing will happen. If during the downstroke of the ram one operator sees that something is not right in the press, he merely releases either hand and the press ram returns.

Four hand controls for operating the master valve may be electrically operated, through push buttons hooked up in series or through air operated pilot valves. In the first case the master valve would be solenoid operated with a spring-return feature, and in the second case the master valve would be built with a small air cylinder in one end and a spring return feature on the other end. On very large machines, where the two operating stations are far apart, the electrical controls are much less expensive and more practical.

Other places where hydraulic safety control circuits play an important part are around hazardous locations and conditions such as explosive atmospheres, toxic or deadly fumes and extremely hot areas. By placing the pilot controls at a safe distance, the operation to be performed can be done easily and precisely with the utmost safety. The operation may even be placed in such a position that it cannot be seen directly by the operator yet he has positive control at all times.

When using pilot controls the operator has all movements at his fingertips and there is no time lapse involved. The master valve is placed very near the operating cylinder. It may be necessary to build shields around the cylinders when they are located near fumes or intense heat in order to give them adequate protection. If it is necessary to expose the piston rod for a long time high temperature packing may be required.

In order to eliminate any chance of electrical spark, the electric hydraulic power device on some installations is placed in a separate room from the machines and then piped through the wall to the machines. Electrical controls are eliminated on the machines.

Machine safety is a major consideration. With the

very complicated and expensive machines that are being developed today for performing multiple operations a definite plan for machine safety must be followed. A hydraulic system must be provided that will eliminate human error as far as possible and to accomplish this positive controls are a must.

If you will analyze Fig. 2 carefully you will note definite hydraulic safety features on the circuit of this production machine. First, this machine is designed with interlocking valves No. 10 and No. 11 so oil cannot flow to the fluid motor, which indexes the table through a barrel cam arrangement, until both ram cylinders have fully retracted and have depressed the cam rollers on both of these valves. This eliminates any possibility of the machine misfiring and the table turning at the wrong time. Second, the fluid motor for driving the table is placed in the circuit so that if the table should meet some resistance, such as a piece jamming in the machine, the motor will stall and the oil will dump through valve No. 9 back to the oil reservoir. Relief valve No. 9 is set so that the oil pressure to the motor is just high enough to overcome any friction and index the table. Third, shot pin cylinder No. 17 gives a positive index point for the table. The shot pin does not retract until rams are in the "up" position but does act before the fluid motor starts the table in motion. This positive index is extremely important on accurate pressing applications where dies must mesh.

Operation of Hydraulic Safety Devices

Circuit in Fig. 2 operates as follows: Operator shifts handle of valve No. 12 to "run" position and latches handle of valve No. 13 in "start" position if he wishes continuous cycling of machine. If he wants the machine to go through only one cycle and then stop, he momentarily shifts handle of valve No. 13 to "start" position, then releases it.

This directs pump supply to "out" port B to pilot chamber K of valve No. 4. Piston of valve No. 4 moves to left, directing pump supply to "out" port M to "in" port P of valve No. 5. Valve piston No. 5 being in position shown, pressure is now directed to top of ram cylinders for downstroke at pressure governed by setting of relief valve No. 6. Pressure is also directed to "in" port P of valve No. 2 and to "out" port Q to port CC of valve No. 17, holding lock plunger in place, and out port BB of valve No. 17 into port S of valve No. 3 and out port C to ports X and Y of valves No. 5 and No. 7.

Both rams advance and at end of downstroke pressure build-up in line opens valve No. 8, directing pilot pressure to port A of valve No. 3. Piston of valve No. 3 moves to right, exhausting X and Y of valves No. 5 and No. 7, and directs pressure from port S to port B to port U of valve No. 7. After adjustable dwell period of valve No. 7 expires, port U is opened to port V and pilot pressure is applied to port D of valve No. 5, shifting piston to right. Pump supply is now directed through port O of valve No. 5 to lower side of ram cylinders and to port AA of valve No. 10. Both rams return and at end of up stroke, valves No. 10 and No. 11 are depressed to position shown.

Pressure at port AA of valve No. 10 is now directed to BB to "in" port CC of valve No. 11 and "out" port DD to fluid motor No. 16 and to port AA of valve No. 17. Lock plunger is withdrawn and fluid motor now rotates index cam and cam shaft, carrying operating cams for valves No. 1 and No. 2. The table indexes and release of piston in valve No. 2 connects pressure port P to "out" port R to pilot chamber W of valve No. 3, shifting piston of valve No. 3 to left of position shown. Port S of valve No. 3, however, has no pressure as it is supplied from port BB of valve No. 17 which is blocked when lock plunger is retracted.

Cam momentarily closes and overrides valve No. 1, applying pilot pressure to port G from port F to pilot chamber J, shifting valve piston No. 4, completing cycle and by-passing pump back to tank through port M of valve No. 4.

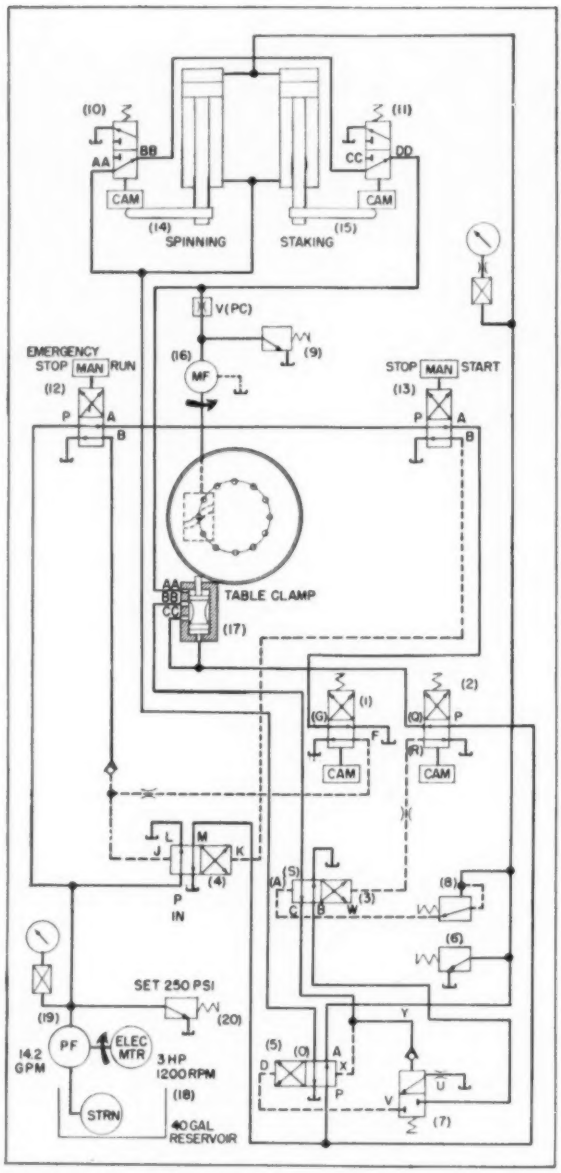


Fig. 2. Many hydraulic safety features have been incorporated in this circuit which uses a safety hydraulic index

Overload protection is easily built into the machine when using even a basic hydraulic system. The relief valve placed at the power unit assures protection for the pump and sets the operating pressure for the entire system. If operating pressure required in one part of the circuit is to be lower than in another portion, the addition of a reducing valve will be a solution. In some instances automatic unloading valves may be a desirable feature to give positive protection.

The circuit as shown in Fig. 3 is often used to advantage on press circuits for reducing heat during standby periods. In this circuit the relief valve No. 5 is set so that there is just enough pressure on the rod end of the cylinder to overcome the weight of the ram and the die fastened to the end of it. This allows the oil to flow back to the oil reservoir at very low pressure.

The circuit functions as follows:

Operator places work on platen of press and shifts handle of four-way, two-position valve No. 4. Oil pressure at 1000 psi flows to blind end of press cylinder

No. 7. Oil pressure forces piston of press cylinder No. 7 forward during pressing cycle. At end of pressing cycle, operator shifts handle of valve No. 4 to original position, oil, at 50 psi pressure, returns press ram to original position.

Operator unloads work and reloads. During standby period, pump pressure dumps to reservoir at 50 psi.

In some press circuits a three-position, open center, four-way master valve is used but there is a possibility that after the valve and cylinder develop internal leaks, due to long service, the ram may drift during long standby periods and cause considerable damage to the dies. If the standby periods are short the three-position, open center valve is recommended. Without either of the above types of protection, it has been observed that the oil in some power units has become so hot that it actually boils.

Emergency stop controls for hydraulic systems are often electrically operated. By pushing a stop button all action ceases. The push button station is connected to the solenoid operated master valves.

By using a hydraulic control system maximum safety is afforded to the workpiece without expensive devices. As an example, in a deep drawing process one lot of metal may draw easier than another due to the structure of a certain lot. By using a hydraulic press the speed of the ram can easily be varied from maximum to minimum with an inexpensive flow control valve so that the metal which is hard to draw can be worked at

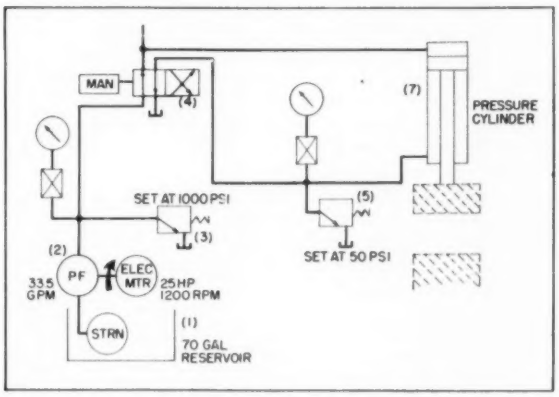


Fig. 3. The dual pressure circuit, using two relief valves, is used to advantage for reducing oil heat during standby

one speed and the metal which can be drawn easily can be worked at another speed. If a change of pressure is involved this is taken care of by adjusting the relief valve spring.

In drilling operations hydraulic control of the drill feed saves many drills and workpieces. Again if one lot of material is harder than another, compensation for this is readily available with the hydrualic system. This is also true of boring, piercing, coining and many other types of machine operations.

Hydraulically-operated power chucking equipment is another fine example of the protection that is afforded the workpiece. One example is the turning of heavy tubing; for the roughing operation full pressure is applied in order to keep the workpiece from slipping when the roughing tools dig in. If this full pressure were kept on during the finishing operation, undesirable distortion would result. By merely shifting a valve, the high pressure can be changed to low pressure without removing the workpiece from the chuck.

Also, in power chucking, when using a universal type chuck for chucking several different workpieces of various cross sections, by only changing the false jaws, the proper gripping pressure can be applied to each piece by changing the operating pressure of the relief valve. This eliminates the possibility of distortion and breakage of the piece as well as the possibility that

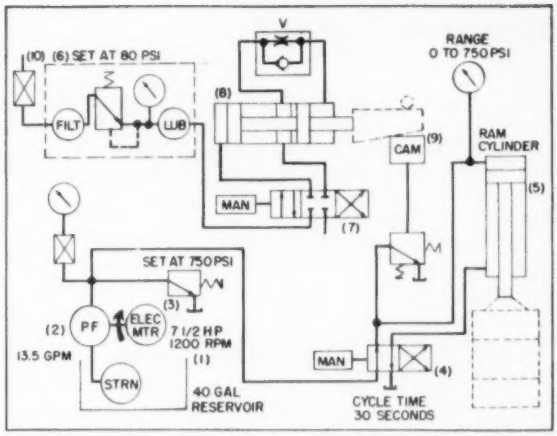


Fig. 4. This combination circuit is used for pressure testing at different increments. Many specialized tests are possible

some pieces may not be chucked tight enough. This also applies to collets and power-operated mandrels.

Figure 4 shows a successful combination circuit for pressure testing at different increments. By the use of the air-hydraulic cylinder to actuate the cam-operated relief valve for steadily increasing or decreasing pressure, many specialized tests may be conducted. A system of this type works well for checking the bursting strength of tubes, etc. This same circuit has been used in forming and pressing operations. The circuit performs as follows:

Operator loads work under die on end of ram cylinder No. 5 and shifts handle of four-way, two-position hydraulic valve No. 4. Oil flows to blind end of ram cylinder No. 5 at low pressure.

Operator shifts handle of four-way, three-position air valve No. 7 and air flows to blind end of airdraulic cylinder No. 8.

Piston of airdraulic cylinder No. 8 starts forward at speed set by flow control on closed hydraulic circuit. On this cylinder, cam on end of piston rod contacts cam roller on hydraulic relief valve No. 9 and pressure begins to build up in hydraulic circuit.

Ram of cylinder No. 5 moves forward at pressure set by cam-operated relief valve No. 9. When airdraulic cylinder reaches end of stroke, full pressure is built up through valve No. 9. Operator may control this pressure by merely shifting valve No. 7 into neutral position anytime during outstroke of cylinder No. 8.

Operator shifts handle of valve No. 8 and valve No. 4, causing pistons No. 8 and No. 5 to retract.

Hydraulic and Electrical Standards

IN ORDER TO PROMOTE uniformity throughout the corporation, and to provide information to manufacturers who supply equipment, General Motors Corp. has developed an Equipment and Operations Standards book. The Standards include all of J.I.C. (Joint Industry Committee) Standards which cover certain categories of equipment, primarily hydraulic and electrical equipment.

The corporation makes these available to outside companies at a nominal charge. They are available in uniform bindings, in a looseleaf binder with an embossed cover on 8½ by 11 in. size. Initial subscription to the Standards is $10.00 and Annual Revision service is $5.00 per year.

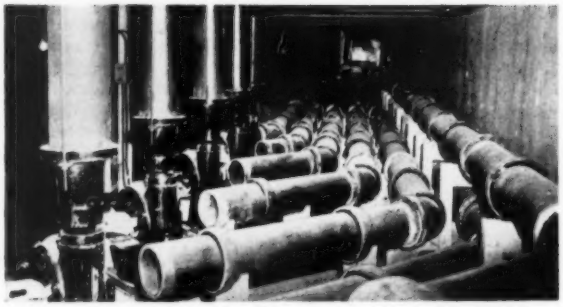
Purchase orders for the Standards should be sent to General Motors Corp., Production Engineering Section, 15-228 General Motors Building, Detroit 2, Michigan.

Clay Pipe Duct System Handles Acid Fumes in Laboratory

At the University of Washington, in Seattle, the new Health Sciences Building contains a system of vitrified clay pipe for venting chemical fumes from the medical and dental laboratories.

Hydrochloric acid and nitric acid, often heated during research studies in the building, emit powerful fumes during their heating. Radioactive isotopes studied at the laboratories also produce fumes that must be exhausted.

Hoods catch the fumes in the laboratories, and direct them to clay pipe ducts, 2200 ft of which are installed in the building. Acid proof fans pull the fumes up to the roof, where they are dispersed into the atmosphere.



Tornado-Damaged Plant Rebuilds As Production Speeds Back to Normal

Reconstruction in the wake of disaster was the byword in the experience of the Norton Company, after a tornado tore through Worcester, Mass., in early June.

Directly in the path of the tornado stood the company's new precision grinding machine plant, which had been formally opened only two months previously.

The wind tore off 80 per cent of the roof, and most of the glass and Transite siding. It turned the cafeteria into a pile of rubble, with the roof hanging down over the tables. Fortunately, although several hundred people were in the plant at the time, only eight were injured.

As soon as the injured had been cared for, the reconstruction of the plant began. Plants Engineer Allan F. Hardy, Jr., was placed in complete charge of the reconstruction. An auxiliary guard force was recruited from employees who returned to the plant to help, and the cleanup process was started. By the end of "tornado day," all loose debris had been cut down in the plant, lights restored in all fixtures still in place, machinery rustproofed or covered with tarpaulins, plant security assured, and repair materials on their way to Worcester.

Within 62 hours after the tornado struck, the plant was back in limited production. Pictures taken along the west wall of the plant, one the day after the tornado struck and the other a month later, point out the speed of complete reconstruction progress, after temporary repairs permitted resumption of the company's grinding machine production.

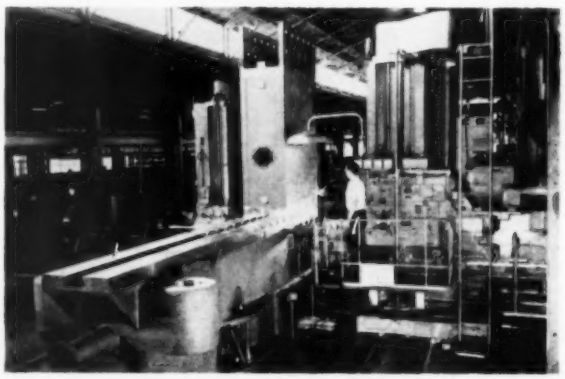
Big Machine Tool Does the Moving, Lets the Work Stand Still

Largest machine tool of its kind on the Pacific Coast, a series 50 horizontal boring, drilling and milling machine is working around the clock at the Torrance, Calif., plant of the National Supply Company.

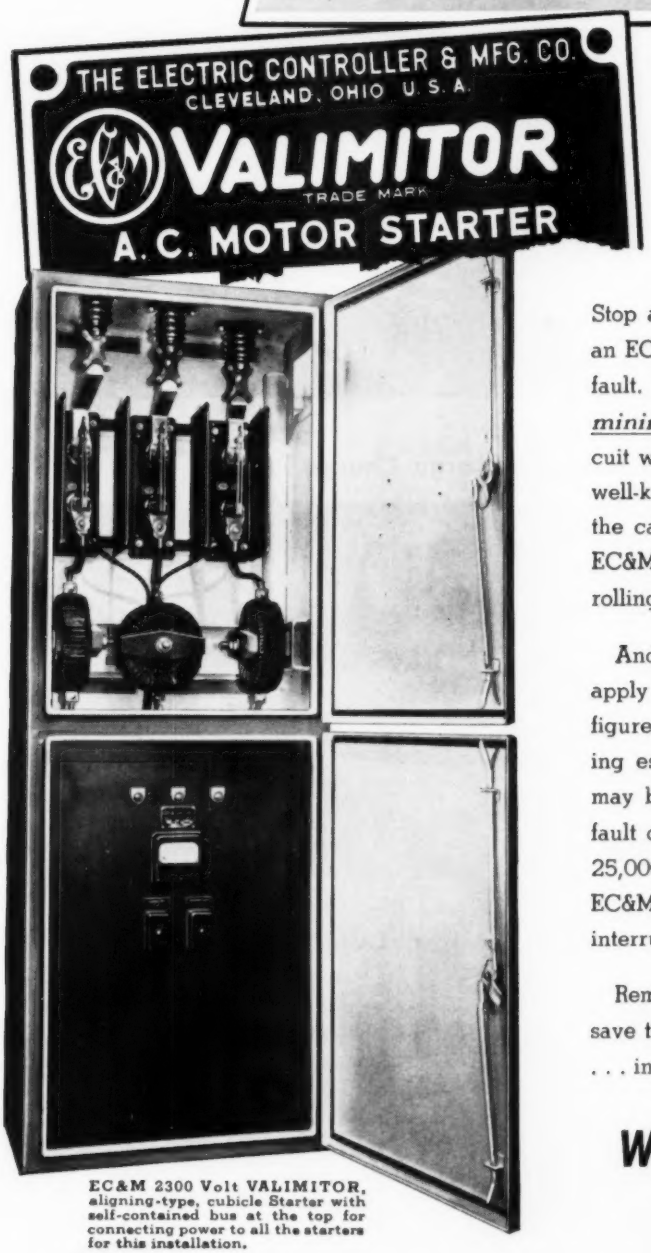
Manufactured by the Giddings & Lewis Machine Tool Co., the huge unit exemplifies the latest in machine tool design. It is a floor-type machine on which the work remains steady, with the 7-in. main spindle traversing the work.

The spindle of the machine moves over an area 24 ft long and 8 ft high. A floor plate 24 ft long and 12 ft wide is provided for setup of the work.

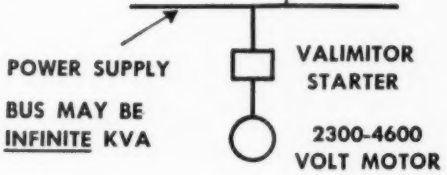
One hundred eight yards of concrete were poured into the foundation for the machine, and its underground power lines were laid a distance of 1000 ft.



RESTART in a matter of seconds -- no parts to replace --PAYS for itself, if there's ONE FAULT



EC&M 2300 Volt VALIMITOR, aligning-type, cubicle Starter with self-contained bus at the top for connecting power to all the starters for this installation.



Stop and consider the reduction in down-time an EC&M VALIMITOR Starter will *save* after a fault. Damage in the motor circuit will be *minimized* by the VALIMITOR coils—the circuit will be cleared *quickly* and *safely* by the well-known Type ZHS magnetic contactor. When the cause of the fault has been remedied, the EC&M VALIMITOR starter will get production rolling again in a matter of seconds.

And EC&M VALIMITOR Starters are easy to apply on a system of *any* capacity. No need to figure "short" capabilities of existing bus including estimate for future growth. These starters may be applied to a bus of infinite KVA . . . fault currents will be limited to a maximum of 25,000 KVA (steady state current) and the EC&M Type ZHS Contactor of 50,000 KVA interrupting capacity clears the circuit quickly.

Remember that EC&M VALIMITOR Starters save time . . . in application . . . in installation . . . in restarting after a fault.

Write for **T9-117**

Reprint Bulletin

THE ELECTRIC CONTROLLER & MFG. CO.
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For more facts circle 552 on Reply Card

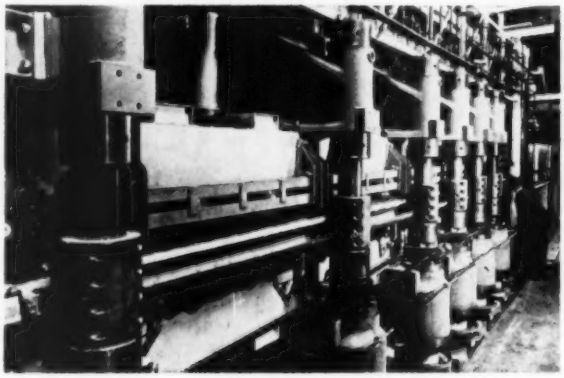
Machine Uses Paper-Making Techniques to Produce Pressed Wood Panels

An automatic machine called the Bartrev Press is in operation in England, converting wood and wood wastes into high quality panels, in a continuous "sheet."

In 24-hr operation near London, this plant is producing at the rate of 30 million sq ft annually. The press, using over 50 tons daily of normally wasted wood materials, is turning out the wood panel at speeds up to 30 fpm, in a 4-ft wide sheet.

Starting with wood shavings, trim, and other forms of cellulose, the raw materials are first reduced to uniform fragments. Weighed and combined with small quantities of an inexpensive resin, the treated material is evenly distributed over the surface of an endless 50-in. wide stainless steel band. On this band, the material goes through r-f heating units, then to the heated pressure zone of the press, shown in the photograph.

Here, another stainless steel band is pressed down upon the ribbon of wood. Gradually exerted hydraulic pressure flattens the sheet as it progresses through the press, and the finished board is delivered in a continuous strip, to be trimmed and cut to length by a traveling cut-off saw. The completely automatic machine is 131 ft long, 20 ft high by 7½ ft wide.



Isotope Inspection of Refinery Reactor Requires "Large Charge"

The largest single industrial collection of radioactive isotopes in the U.S.—76,000 millicuries of Iridium 192—was used by Isotope Products, Inc., in an inspection of a reactor at the Eastern States Petroleum Co. refinery in Houston, Texas. This inspection also marked the first time that isotopes were used to look for hydrogen blisters in the steel of a refinery reactor unit.

Under inspection was a reactor 20 ft high and 5 ft, 6 in. in diameter. Steel, 2⅜ in. thick plus 5 in. of concrete and a ⅛-in. thick chrome steel liner, made up the wall thickness to be penetrated in the inspection.

As the first step, the crew taped film sheets all around the steel tank. Each film was carefully oriented and catalogued as to its exact position on the tank surface. Then, the Iridium 192 charge was loaded into a special camera and lowered on a steel cable into the reactor.

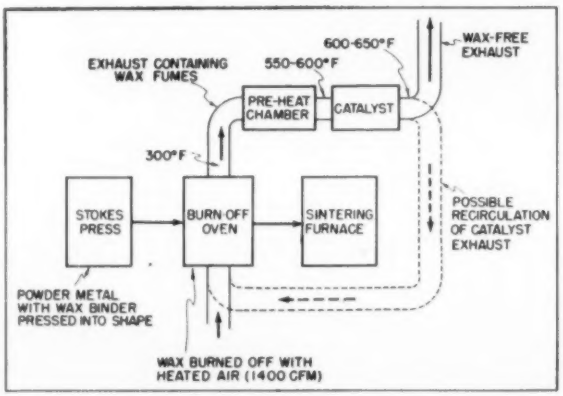
Catalytic Oxidation of Wax Fumes Improves Comfort, Quality and Safety

Plagued by irritating smoke containing wax fumes and particles that blew into their office building, plant engineers of the RCA Victor Division, Camden, N.J., installed a bed of the new Oxycats to oxidize the noxious fumes at their source—a burn-off oven in RCA's powdered metals division.

In addition to checking an annoying smoke problem, the installation eliminated a serious fire hazard and has helped to maintain consistent quality of the powdered metal cores.

The Oxycat is an air pollution control and heat recovery device developed and distributed by Oxy-Catalyst, Inc.

In making powdered iron components at RCA, a wax binder is used, that has to be burned off the parts before they are sintered. It was this burn-off that created the irritating smoke. The fumes are now sent through a catalyst bed, where they are burned at the surface of the catalyst-coated rods that make up the bed. This catalytic oxidation has removed the former wax buildup that had been restricting flow of air through the sintering oven, and also has removed the dangerous "pockets" of fumes that formed above the oven.



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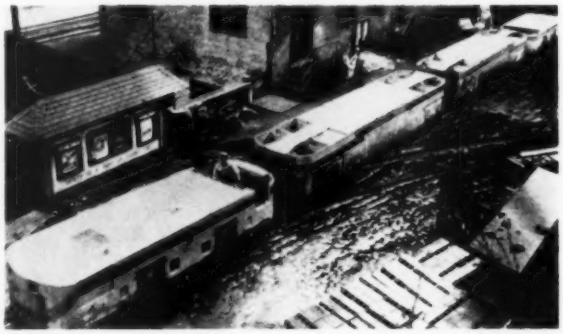
Coal Haulage Locomotive Is World's Largest Battery-Powered Unit of Its Type

A self-contained main line haulage unit made up of two twenty-ton locomotives powered by 37 tons of Gould-National storage batteries, has been installed by the Olga Coal Co., a Youngstown Sheet & Tube Co. mining operation.

The entire unit, consisting of two Jeffrey haulage locomotives and two power cars housing 625 kwh of battery power, is over 100 ft long, yet stands less than function—to haul large coal tonnages in 50 car trains.

Both driving sections of the locomotives are operated by remote control as a single unit, controllable from either end. Each driving section is equipped with two independent braking systems, one standard air braking, the other dynamic braking of the electric drive motors.



Automatic Artificial Respiration Equipment Goes to Plant Fires

As part of a program to provide complete respiratory protection to all employees, Ford Motor Company's Aircraft Division, Chicago, has made equipment available for use in any case of asphyxiation in the plant.

Recently developed equipment, called the Pneolator, made by Mine Safety Appliances Co., has been added to the company's fire truck, as well as installed in the plant first aid stations. This equipment automatically inflates a patient's lungs, then cuts off pressure to allow his chest and lungs to relax naturally, thus carrying on artificial respiration automatically.

Carried on the fire truck, it is immediately available in cases where the firefighters are overcome by smoke or fumes while fighting a plant fire.

Mobile Stock Bins Take Parts to the Assembler to Save Steps, Time

To eliminate time lost by personnel traveling between their work stations and the central stock crib on the Convair-Liner primary assembly line, Convair's San Diego division has developed mobile stock carts which take parts to the employees.

Instead of serving the employee through an issue window, personnel in the stock crib fill mobile parts racks which are wheeled into the assembly areas.

These "serve-yourself" units each contain a kit of parts made up of the exact number of items required at a given station for a given period of time in the production schedule.

Transfer Conveyors for Big Steel Slabs Require Big Speed Reducers

Two worm gear speed reducers, among the biggest in their class, were recently designed and manufactured by De Laval Steam Turbine Co. The reducers will drive transfer conveyors in continuous service, moving heavy steel slabs in a new 45 in. Universal slabbing-blooming mill being built by the Mesta Machine Co.

The slab transfers, which the worm gear units will drive, are designed to convey steel slabs up to 12 in. thick and 42 in. wide, weighing over 55,000 lb.

These speed reducers, with a reduction ratio of $26\frac{2}{3}$ to 1 in a single set of gearing, are each driven by a 200 hp, 410 rpm motor, coupled to the input shaft.

Welded steel construction in the gear casings obviated the need for foundry patterns and insured a casing design of maximum stiffness and great shock resistance.

for fast operation
in congested areas and
narrow aisles

aisle saver®
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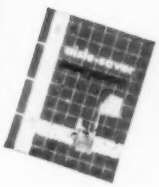
WRITE FOR BULLETIN 5210
This informative, illustrated bulletin describes the complete aisle saver line with load and clearance charts, lifting capacities and other data. Every plant manager should have a copy.



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ADDITIONAL ADVANTAGES: Stand-up end control permits operator to get on and off, quickly. 4 speeds forward plus reverse. Hydraulically operated lifting and tilting with all safety features. Electrically powered for silent fume-free operation without fire hazard.

AISLE SAVERS ARE AVAILABLE in capacities of 1000, 2000, 4000 lbs. Model 1000 right angle stacks in 59″ aisles plus load length.

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Elect. operated.
Cap. 1000 to
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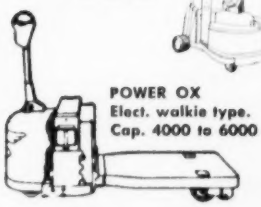
Cap. 2000 to
3000 lbs.



POWER OX
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Cap. 4000 to 6000 lbs.

PALLET HANDLING
Elect. or hand pallet
handling trucks.

CRESCENT TRUCK COMPANY
Lebanon, Pennsylvania

CRESCENT

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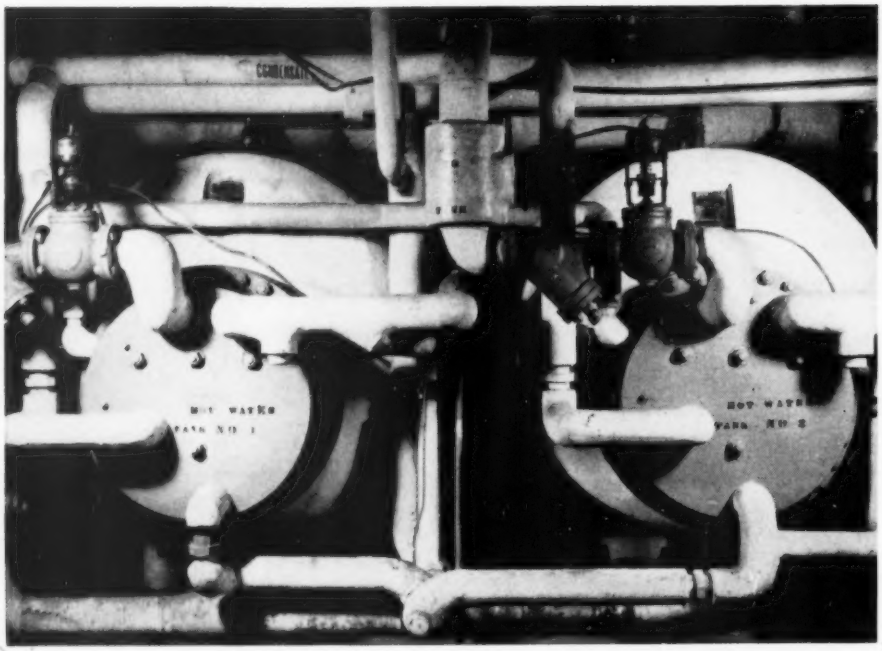

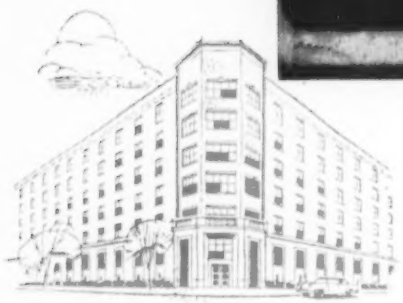

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3. BOUNDARY FENCE illumination cuts down pilfering and sabotage, provides high visibility along boundary fence for 24-hour protection at surprisingly little cost.

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You gain speed and efficiency, safety and security, when you illuminate loading platforms, entrance gates, parking lots, and plant entrances. And you'll find that an investment in adequate G-E outdoor lighting will pay for itself over and over again.

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Whatever your outdoor lighting needs, G.E. has a complete range of industrial lighting equipment to exactly suit your requirements. Call your local G.E. Sales Office or authorized distributor for advice on good lighting at your plant. Or write for "Outdoor Lighting for Industrial Plants." Just ask for GEA-3640. Address Section 451-184, General Electric Company, Schenectady 5, N. Y.

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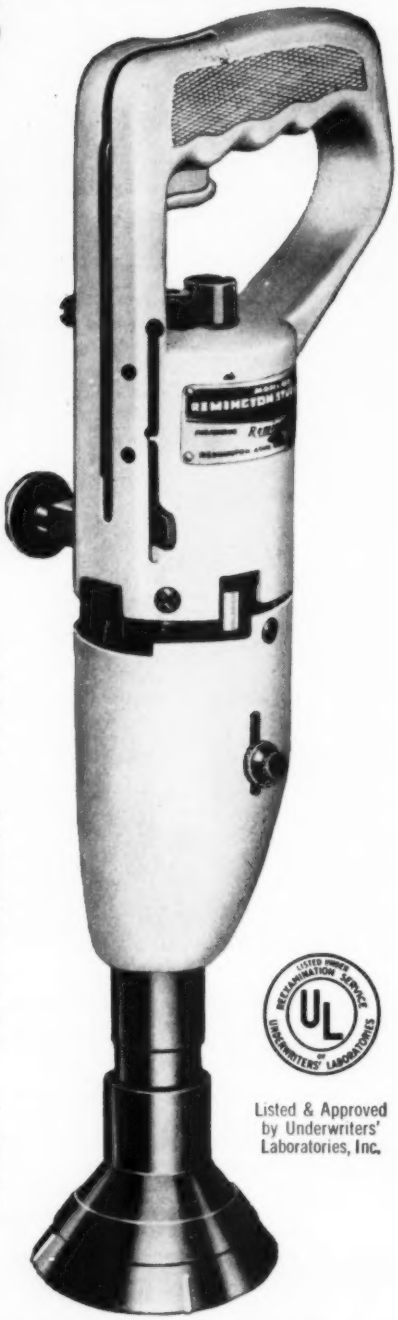
You can drive studs ARROW STRAIGHT into steel or concrete with

MODEL 450 REMINGTON STUD DRIVER

The widest power range of any powder-actuated tool!



The Model 450 Remington Stud Driver is the most efficient fastening method in use today. Its exclusive advantages are unequaled by any other powder-actuated tool.

You get consistently straight driving on every type of fastening job with the long heel cap on all Remington cartridges. It acts as a perfect gas seal and provides extra power. These colored heel caps clearly mark the six different 32-caliber power loads that are available. You can select the *right* cartridge for each job quickly and easily.

The Remington Stud Driver needs no separate parts for power control or loading—nothing to lose or break. Just a twist of the wrist opens the Model 450. Insert stud and power cartridge as a unit . . . close and you're ready. Triple safe, this superior tool has a separate lever that must be depressed and *held* with one hand before and during squeezing of the trigger with the other hand. Two *additional* devices prevent operation except in proper fastening position.

Completely self-powered, the Model 450 sets up to 5 studs per minute in fastening steel or wood structural pieces to concrete or steel surfaces. Its light weight—only 5½ pounds—makes it ideal for use overhead or in confined spaces. To speed operation further, an exclusive ejector snaps the fired case out of the tool instantly—no fumbling, no tools needed.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.*

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NEW, FREE BOOKLET shows you a hundred different ways the Model 450 Remington Stud Driver can speed *your* construction fastening. Packed with illustrations, it tells you where and how this tool can save time, reduce fatigue and cut costs. Send in the coupon below for your copy.

"If It's Remington—It's Right!"

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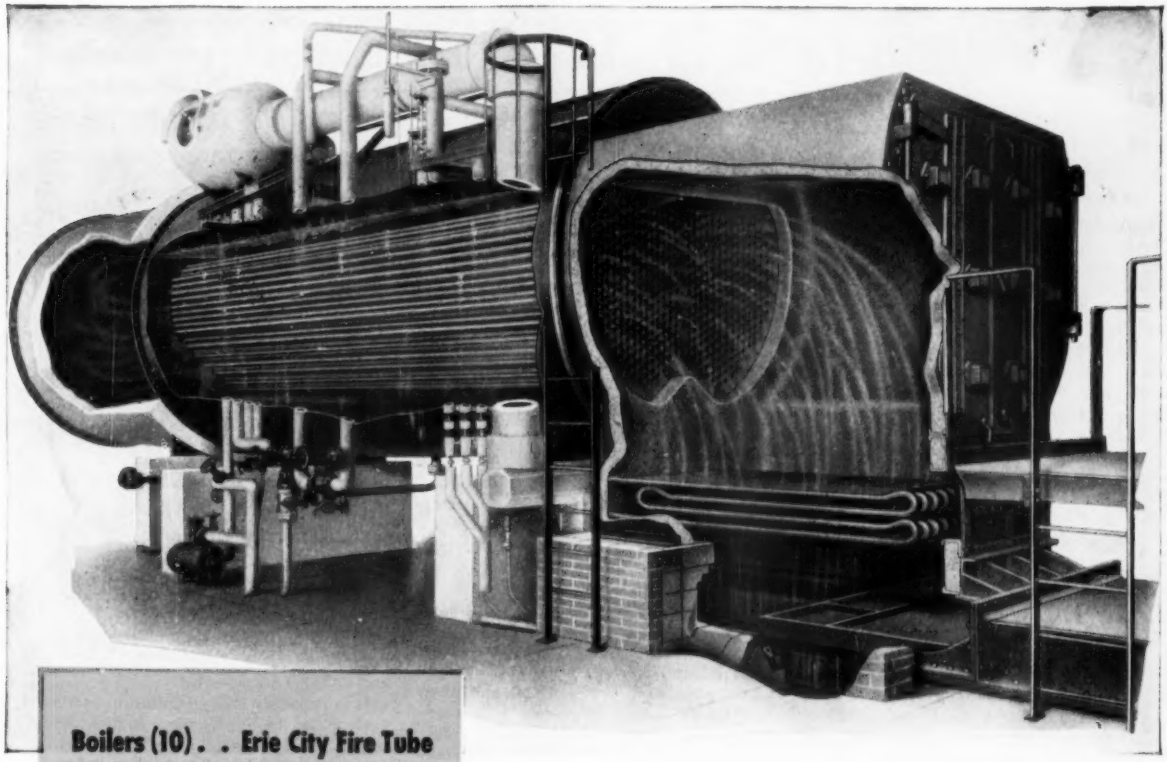

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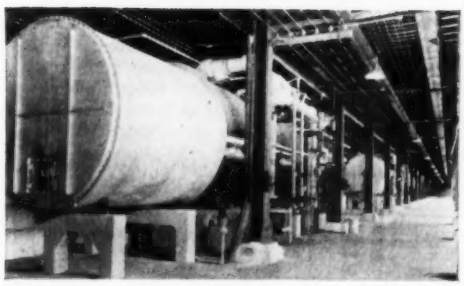
Design Pressure . . . 300 p. s. i.

Capacity . . . . 15,000 lbs/hr.

Superheated Steam Temperature . . . 525° F

Fuel . . Waste gases from Open Hearth furnace enter boiler at about . . . . 1200° F



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Stop giving WASTE HEAT

A Free Ride from your Open Hearths

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IN these days of increased operating costs investigate the economy of waste heat recovery. A large steel producer tapped a source of wasted B.t.u.'s from 10 Open Hearths and converted them into 150,000 lbs. of 525° superheated steam per hour. Fuel is the big cost in steam generation; therefore "free fuel" will give you a head start in your steam generating program.

Erie City manufactures a complete line of fire tube and water tube waste heat type boilers and has wide experience in heat recovery.

Outline your waste heat conditions—our experience is yours for the asking.

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summarized for your convenience

Edited by M. E. Heniken

1—SNAP ACTION SWITCHES for one-way actuation

Two new precision snap-action switches have spring loaded, hinged roller arms actuators. They are designed for one-way actuation by cam, dogs or slides. One design has a 3/16 in. dia roller and the other a 3/8 in. dia roller. They are particularly useful in providing an electrical impulse to relays or solenoids from one direction only of a reciprocating movement.

Each of the switches is available with either solder lug terminals or screw terminals. They are listed by U. L. for 15 amp, 125, 250 or 460 v a-c; ½ amp, 125 v, d-c; ¼ amp, 250 v, d-c.

Contact arrangement of both of these switches is single-pole, double-throw. Micro Div., Minneapolis-Honeywell Regulator Co.

2—PICKUP TRUCKS in two sizes, for light hauling

Expansion of company's Autoette line to include two new electrically-powered pickup trucks, designed for light hauling, is announced.

They are being manufactured as quarter-ton and half-ton models, ideally suited for use in connection with the needs of industrial plants. The new pickups offer quick, silent, economical hauling and are run by electricity only. The heavy-duty batteries can be recharged overnight and the manufacturers assert that they can be operated for $1 per month—for up to 12 hr of daily hauling. Blood Sales Co., Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 35-36 and 133-134.

4—RECOVERY PROCESS takes chrome out of rinse water

The removal or recovery of chromic acid from rinse water is of interest to platers. A process has been developed whereby rinse water can be passed through ion-exchange resins to effect nearly 100 per cent chrome recovery. The advantages to the plating shop are twofold, it is claimed: the chromic acid waste disposal problem is eliminated and chromic acid is recovered.

In the process, the rinse water is first passed through a cation column to remove aluminum and copper and then through an anion resin bed which removes the chromic acid. The chromic acid is then recovered in the regeneration process. Tests show that the same resins can be used economically for 100 or more cycles, it is reported, and the savings in chromic acid will usually repay the operating costs of the entire process, which means that the waste disposal problem can be solved at no cost. In addition, as a byproduct of the process, the user obtains a supply of demineralized water for use in rinse tanks. Barnstead Still & Sterilizer Co.

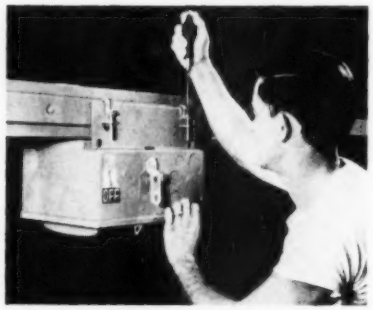
3—STRUCTURAL PANELS serve as windows, skylights, partitions

Improved daylighting efficiency plus reduced maintenance costs are said to be achieved through the use of Structoglas panels on many industrial applications. This glass fiber reinforced material diffuses soft, glare-free light over large areas. Worker fatigue, below skylights and near window walls, is further reduced by the elimination of hot-spots as Structoglas filters out much of the infra-red and most of the ultra-violet rays of the sun.

Furnished in flat sheets as well as in standard corrugations that nest with steel, aluminum or asbestos roofing and siding material, this material can easily be incorporated as an integral part of the building. Easily worked with ordinary hand tools, it can be sawed, drilled and bolted directly to rafters, joists and purlins. It is claimed shatterproof.

Rusted out and warped fixed sash can be inexpensively replaced with these panels, nested into the existing metal roofing or siding. Possessing structural strength, the panels require but simple low-cost framing. Where used without sash, all trim painting is eliminated. The flat sheets are used for permanently reglazing broken window panes.

Where partitions are desired, the product provides an ideal light transmitting material that can be installed at lower cost than many walls. It is available in a wide range of medium and low light transmission qualities. International Molded Plastics, Inc.



5—PLUG-IN DEVICE taps into the overhead busways

Getting power from overhead busway to machines below has been made easier and faster by FG Flex-A-Plug.

Working on the same principle involved in plugging into a wall socket, the new item taps power from a heavy current-carrying busway for machines and other equipment.

It is reported that installation is made easier and faster by new hanger clips which hold a plug in position while screws are tightened to anchor it firmly to the Flex-A-Power housing.

Electrically, the new device features the same type of interior used in the manufacturer's HCI Safety Switches. This interior operates on the circuit breaker principle of arc interruption. The use of grid pins, magnetic repulsion and other circuit breaker principles to interrupt arcs gives this interior a high momentary current rating, the ability to resist heavy current surges without damage, it is explained.

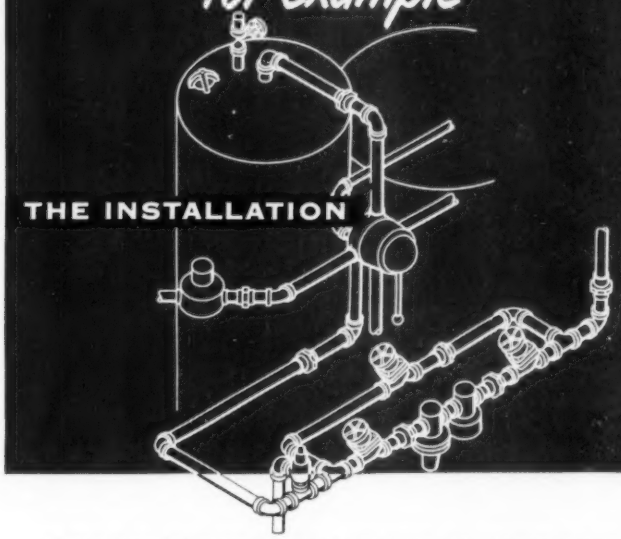
The new FG plug is available in 30, 60, 100 and 200 amp ratings. Trumbull Electric Dept., General Electric Co.

6—LIFT TRUCK for heavier loads and greater heights

Designed for maximum safety with one-man operation this new lift truck is made in sizes with lifting heights of 68, 80 and 100 in., and features a lifting rating of 1250 lb. The hydraulic system is powered by an automotive type battery and equipped with a built-in charger with automatic cut-off and trickle charge.

Features of the truck include an electronic switch to cut off power at maximum height and prevent jarring the load and damaging the hydraulic system, also a hand operated brake designed to prevent movement of truck when loading and unloading and brake the truck when traveling up and down inclines. While this truck is of the fork lift type, it can be equipped with a "snap-on" platform to make it an all around combination lift truck. Manufacturer says its low cost makes it practical for small or large plants. Safeway Industrial Equipment Corp.

This Valve Stops the "Up" in Upkeep ...on Water Service Piping, for example



At the Excello Paper Products Co., Inc., Cincinnati, using Crane Diaphragm valves on city water supply lines; also on plant service water piping, hot and cold.

VALVE SERVICE RATINGS

SUITABILITY:	Doing what other valves couldn't
FEATURES:	Packless - Long Life Diaphragm
MAINTENANCE COST:	No regular maintenance needed
SERVICE LIFE:	Outlasting other valves many times
OPERATING RESULTS:	Safety hazard to personnel stopped
AVAILABILITY:	Crane catalog item - No. 1610

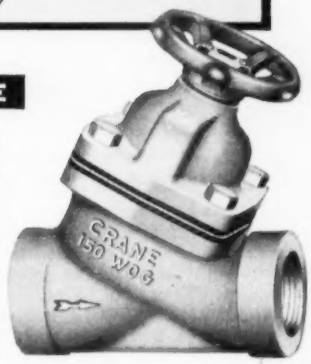
THE CASE HISTORY

Typical of many processes using a lot of water, this plant has numerous open end lines and hose connections. And because of very frequent operation, the valves formerly used in these lines required more than usual servicing to keep up with leakage, dripping hose lines, and hazardous, messy floors.

Crane No. 1610 Diaphragm valves were selected to replace the troublesome conventional valves. Immediately these packless valves stopped the annoyance and expense of stuffing box and seat leakage. Their pliable disc insert ring made a tight seat on open end lines with minimum effort on handwheels.

The replacements were started about 2 years ago. With no attention whatsoever, all Crane Diaphragm valves remain tight, and the plant's water leakage problem remains solved.

THE VALVE



Water is but one of hundreds of fluids Crane Packless Diaphragm valves handle efficiently. Their sealed-to-fluid bonnet and "soft-seating" disc are ideal for all sorts of hard-to-hold liquids and gases; also for sludges, slurries, etc. Separate disc and diaphragm design saves diaphragm wear; permits tight seating even should diaphragm fail. Choose these valves from a wide range of materials, lined or unlined body, for corrosive or ordinary applications. See your Crane Catalog, or your Crane Representative.

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES · FITTINGS · PIPE · PLUMBING · HEATING

For more facts circle 558 on Reply Card

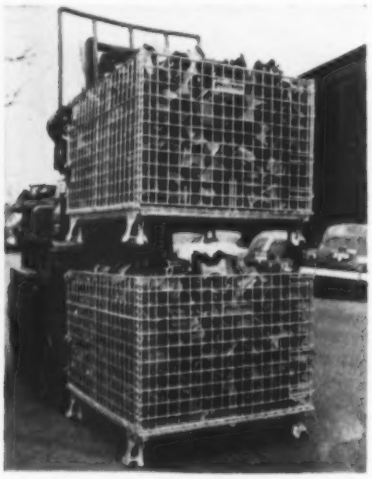
NEW PRODUCTS

(Begins on page 106)

7—METAL CONTAINER built to hold the high loads

Named "Hi-Lode," this new handling unit provides extra capacity for bulky materials through elimination from the undercarriage of center legs and leg braces. Loads can now be heaped well above the top rod. Malleable steel corner legs and new frame design of interlocked U-channel beams are utilized to provide rigidity and solidity in stacking.

Like all of company's Palletainer units this features electrowelded, reinforced, steel rod construction with eight-way entry for fork trucks. It folds to one-fifth space when empty to save freight on return trips. These units come in 2,000, 4,000, 6,000 lb capacities. Union Steel Products Co.

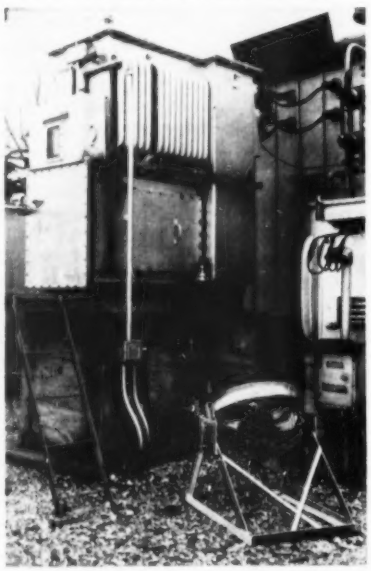


8—WEATHER PROTECTED FANS work outdoors, unattended

Production has begun on a new line of weatherproof fans for transformer cooling and other city or outdoor applications where the fan must operate unattended. They are available with blade sizes of 16 to 30 in. with air delivery ratings from 2820 to 6710 cfm.

On these fans the welded steel mounting ring assembly is phosphatized before painting to assure corrosion resistance and good paint adherence. The new weatherized motor is equipped with rubber gaskets that seal the removable cast iron end head. The fully-sealed, pre-lubricated ball bearings are protected by a grease-filled cavity in the hub that provides a moisture seal around the shaft. A neoprene flinger on the shaft keeps moisture out of the motor on vertical installations.

Single phase, 110/220 v motors are equipped with an automatic re-set type thermo overload protector to protect the windings. Three phase motors for 220/440 v service are available but without the thermo protector. Propellair Div., Robbins & Myers, Inc.



9—SINGLE-PHASE MOTOR is capacitor start and run

This single-phase motor is both capacitor-start and capacitor-run. Called the Type CAP-2; the motor is made in 5, 7½, and 10 hp ratings, and is a 4 pole, 220 v, 60 cy unit. Capacitor-run motors operate efficiently at near-unity power factor, company says, and their design is such that starting current is reduced about 25 per cent, with the same high starting torque. The auxiliary winding remains in the circuit during operation and is in series with the running capacitors. Relays merely remove the starting capacitors when the motor approaches full speed. The main winding is directly across the line.

Elimination of the wound rotor, brushes, and commutator of the previous repulsion-induction design makes for a simpler motor with less maintenance, it is explained, and also eliminates sparking.

Where three-phase power is not available, this new design will permit the use of larger single-phase motors. Westinghouse Electric Corp.

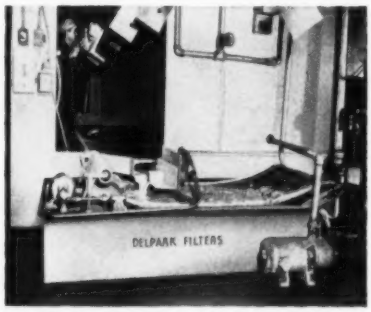
10—FLOOR ENAMEL dries fast, withstands tough traffic

To meet the demands of industry and home for fast dry, quickly hardened floor enamel which can be used almost instantly to withstand the toughest traffic conditions on concrete, wood or metal floors, a new product is announced. Tuf-Quick floor enamel contains the new paint development "Ruvial," a combination of rubber and vinyl so formulated that it is an extremely chemical resistant product, becomes hard almost immediately and when applied to wood it preserves, beautifies and gives a hard velvet gloss chemical resistant coating. When applied to concrete it is lime resistant and durable. Wilbur & Williams Co.

To receive product data circle item numbers on the handy Reader Service Cards on pages 35-36 and 133-134.

11—FILTRATION SYSTEM for paint spray booth water

This filtration system is for the removal of paint sludge and particles from paint spray booth water. Through the use of Delpark filters, many problems formerly involved in the operation of paint spray



booths are claimed to be eliminated.

Of primary importance has been the necessity of removing as completely as possible the overspray from painting operations. External dirt, ever present in the atmosphere of the normal manufacturing plant has, in some instances, added to the problems involved. Most modern methods require considerable labor in maintenance and hand skimming operations.

In this new filtration method, automatic skimming systems move flocculated paint to a weir over which the paint matte is delivered to the filter. Labor is saved, spray booth efficiency is increased and, where reclamation of pigment is desirable, salvage is made easier. Industrial Filtration Co.

12—FILMING AMINE combats corrosion in condensate

Corrosion in steam condensate systems—resulting from the presence of oxygen and acid carbon dioxide—now can be controlled by a film-forming amine, it is announced. It is fed to the boiler in small amounts—2 to 3 lb per million lb of steam.

Hagafilm vaporizes with the steam and deposits a very thin non-wettable protective film on all metal surfaces wherever condensation occurs and throughout the return system, and problems arising from condensate corrosion are thus minimized. If only part of a return system needs this protection, the material may be injected into the appropriate branch steam line.

The material is supplied in both solid and liquid form. The solid is readily mixed with hot condensate to make a dispersion for feeding. The ready-mixed liquid emulsion may be more convenient for boiler plants where needs are relatively low.

There is no danger in handling or

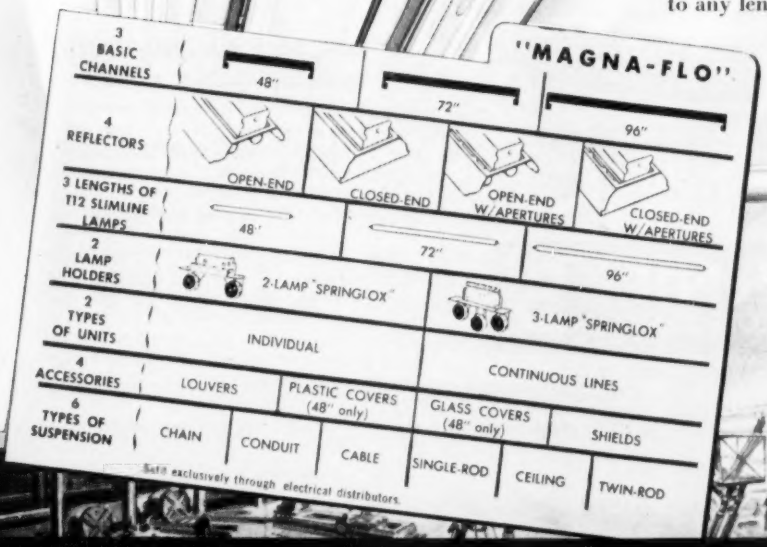
BENJAMIN

Versatile "Magna-Flo" SYSTEMS

go to any length to fit your lighting requirements!

Yes, ONE fluorescent lighting system for all three lengths of T12 Slimline Lamps! It's Benjamin "Magna-Flo" . . . so easily adapted to any size area, any type of location found in industry. No matter where you want fluorescent light . . . high ceilings or low ceilings, assembly lines or drafting rooms, lighting for inspection or mass production . . . whatever the seeing conditions and requirements of the task, there's a "Magna-Flo" System to fill the need exactly. As shown by the chart below "Magna-Flo" is really complete . . . yet so simple to order and specify, because just three channel sizes and four basic reflectors form the backbone of over 300 different fluorescent lighting systems!

Write for Bulletin AD 5705 for complete specification data on Benjamin "Magna-Flo" . . . see how it goes to any length to suit your fluorescent lighting needs!

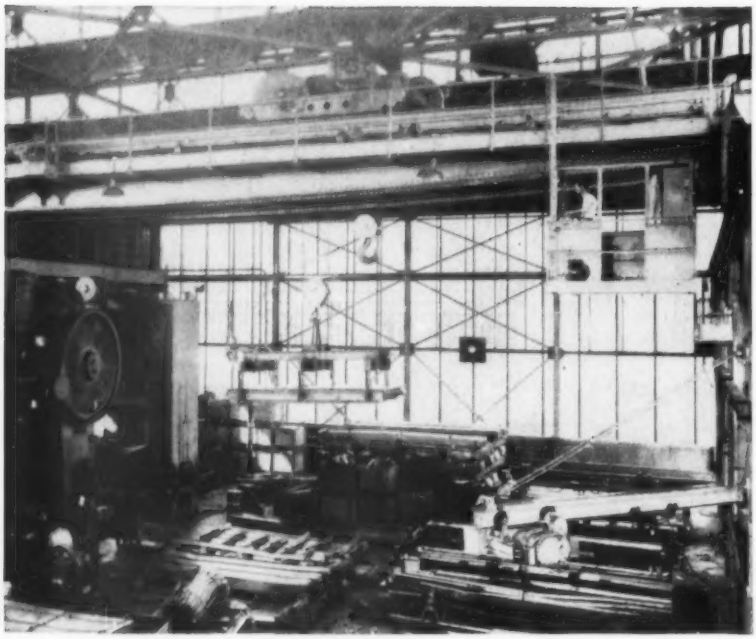


A Product of Benjamin Electric Mfg. Co., Dept. PE, Des Plaines, Ill., makers of famous Benjamin and Leader Line Lighting Equipment and Sound Signals for Industry, Institutions and Commerce.

BENJAMIN "Springlox"—the exclusive "easy-in easy-out" lampholder which reduces maintenance costs and re-lamping time with a patented spring design . . . "Springlox" is standard equipment with all "Magna-Flo" units.

B-297

SHEPARD NILES CRANE

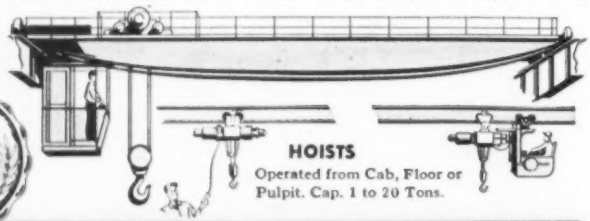


MOVES TONS of material with EASE...

With this Shepard Niles Crane, one man can move tons of material simply by flicking a switch. There's no wasted manpower, no floor or yard space lost—goods move swiftly by the most direct route.

It's easy to see why so many plants prefer low-cost through-the-air handling. But which crane is best for your use? Talk over this problem with the Shepard Niles representative—he's a specialist in loads through-the-air. Write today for Bulletin describing Shepard Niles Cranes—and ask to have a representative call.

CRANES
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated. Cap. 1 to 450 Tons.



50th ANNIVERSARY SHEPARD NILES CRANE & HOIST CORP. 1903-1953

HOISTS
Operated from Cab, Floor or Pulpit. Cap. 1 to 20 Tons.

SHEPARD NILES
CRANE AND HOIST CORPORATION

2229 SCHUYLER AVENUE, MONTOUR FALLS, N.Y.

For more facts circle 560 on Reply Card

NEW PRODUCTS

(Begins on page 106)

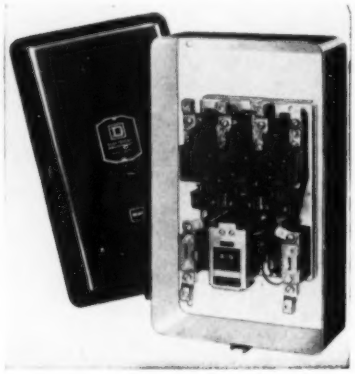
use, manufacturer points out. Hospitals and other institutions where contact steam is employed to cook food and sterilize instruments may use the material safely. Advantages of Hagafilm are detailed in a new bulletin. Hagan Corp.

13—VERTICAL ACTION STARTER is small, easily serviced

During the third quarter of 1953, this manufacturer will have a new NEMA Size 4 vertical action starter in production. With maximum polyphase ratings of 50-hp 220 v, 100-hp 440-550 v, the new starter is considerably smaller than the clapper type starter it replaces. Overall dimensions of the new open type starter are only 9¼ in. wide, 14¾ in. high, 7 3/16 in. deep.

Contacts used on the new device are silver, and double-break to eliminate all flexible jumpers and pivots. The armature has straight line motion, guided at top and bottom.

The new starter features ease of maintenance. All parts are front



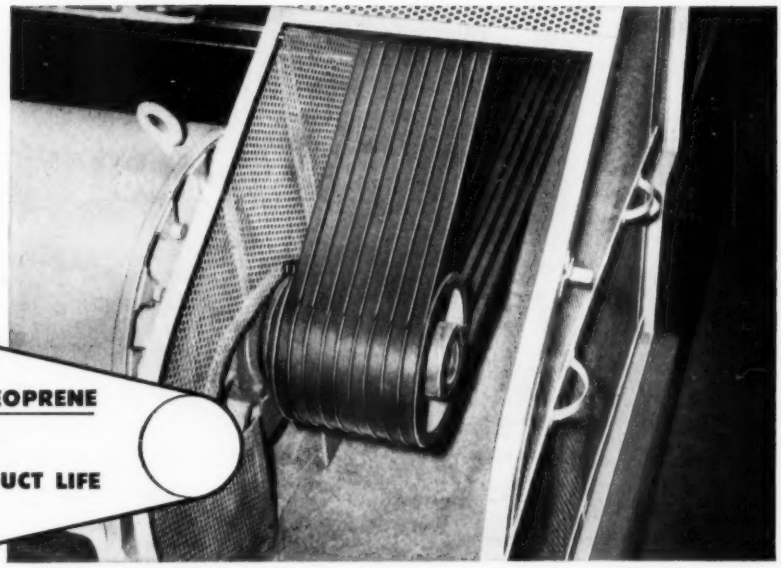
mounted for accessibility. Contacts may be inspected by removing the arc chamber covers, and may be removed or replaced without disturbing wiring.

As many as eight electrical interlocks (4 normally open and 4 normally closed) may be added to the starter. Descriptive information is found in Bulletin 8536F. Square D Co.

14—PORTABLE PAGING UNITS audible, visible signals

Selective paging of "transient" personnel, such as supervisors and maintenance engineers, can now be readily accomplished through unique portable paging units. An integral part of company's electronic paging system, these portable units can be plugged into a-c power outlets locations within the buildings to receive coded paging signals without special wiring. Both audible and visible signals are received.

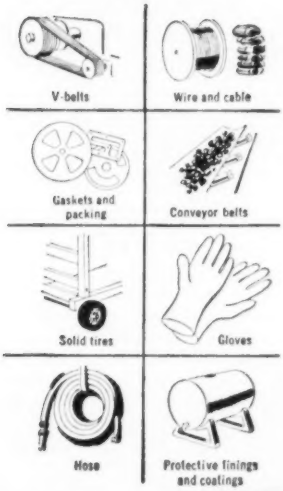
With this system, personnel customarily paged are assigned code numbers which indicate the cadence in which



ANOTHER CASE WHERE NEOPRENE MEANS INCREASED EFFICIENCY, LONGER PRODUCT LIFE

Neoprene V-belts resist heat, oil, abrasion . . . reduce replacement costs

SPECIFY NEOPRENE IN THESE PRODUCTS:



Premature failure of V-belts can cause delays in production—particularly if belts are in hard-to-reach places. That's why so many manufacturers specify V-belts made with neoprene. Wherever these rugged belts are installed, they give lasting service under the toughest conditions.

Heat alone accounts for many failures in ordinary V-belts. But V-belts made with neoprene withstand heat to a remarkable degree without softening or becoming tacky. Lubricating oil and grease from bearings have little deteriorating effect on these durable belts. And neoprene's resistance to flexing results in long service life.

Thousands of other resilient products in every phase of industry owe their improved performance and longer service to the unique properties of Du Pont neoprene. While Du Pont makes no finished goods of neoprene, your rubber goods manufacturer or distributor will be glad to tell you about the neoprene products he supplies.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

NEOPRENE

The Rubber Made by Du Pont Since 1932

MAIL THIS COUPON TODAY

FREE! THE NEOPRENE NOTEBOOK—Every issue describes new products, unusual applications of neoprene . . . shows how neoprene cuts maintenance costs. Clip and mail this coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division PL-8, Wilmington 98, Delaware.

Name_____ Position_____

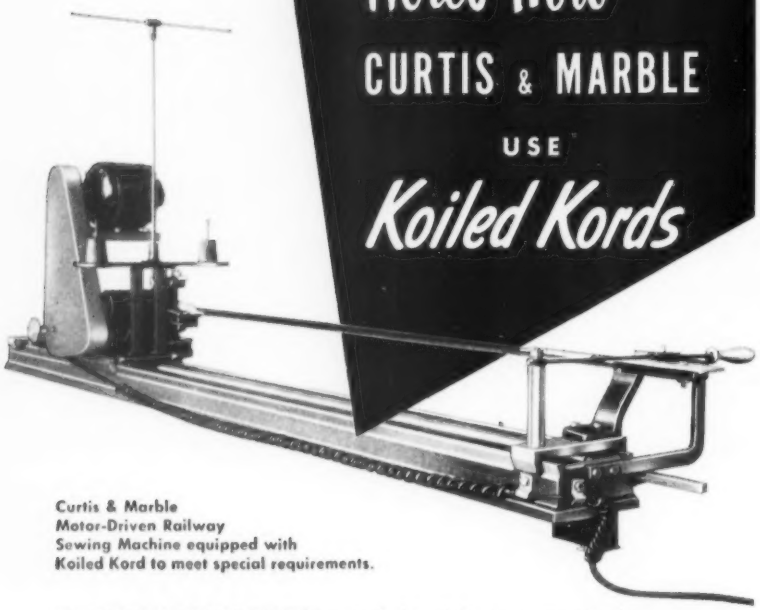
Firm_____

Address_____

City_____ State_____

For more facts circle 561 on Reply Card

Here's How CURTIS & MARBLE USE Koiled Kords



Curtis & Marble
Motor-Driven Railway
Sewing Machine equipped with
Koiled Kord to meet special requirements.

The Koiled Kord E-X-T-E-N-D-S as needed in delivering power to the motor of the Curtis & Marble Railway Sewing Machine. Does it smoothly and without strain too, as the motor moves the sewing machine head the full length of the "way". The Koiled Kord retracts to a neat out-of-the-way coil as the motor returns to position and tension is released.

The cord used on this equipment is an Underwriters' Laboratories Approved two conductor #18 SV cord with neoprene jacket. Koiled Kords are also available in #18 and #16 Type SJO and in #14 and #12 Type SO with 2, 3 and 4 conductors. Larger and smaller Koiled Kords can be furnished for special applications.

Koiled Kords are economical for use where power must be furnished to moving parts because they last longer than conventional cords which fail as a result of the repeated flexing and mechanical damage encountered in this type of application.

Koiled Kords minimize accidents because they stay out of the way. Koiled Kords S-T-R-E-T-C-H as far (up to 5 times retracted length) as moving parts require. Koiled Kords eliminate hazards from long, floor-dragging cords, BECAUSE they always retract to their original length.

For safe, dependable electrical connections on installations that MOVE, specify Koiled Kords.

Write for booklet 1052-G that shows how others have used Koiled Kords to advantage.

Koiled Kords
INCORPORATED
BOX K, HAMDEN, CONN.
IN CANADA: R. D. FLECK & CO., LTD.
OSHAWA, ONTARIO

For more facts circle 562 on Reply Card

NEW PRODUCTS

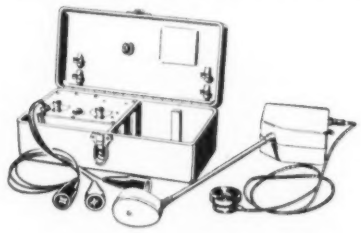
(Begins on page 106)

the individual signal will operate. A code-selecting plug, inserted in the system's central code selector, superimposes high-frequency signaling pulses on regular a-c light and power wiring to sound signals throughout the building in accordance with the specific code selected. Following the individual's paging code, special signals may be sounded to indicate the reasons for paging, such as "telephone call." International Business Machines Corp.

15—CABLE FAULT FINDER is lightweight, easy to use

The availability of a light-weight (23 lb) cable fault finder has been reported. This equipment can be used for locating open-circuits, or low and high resistance shorts of 10,000 ohms or less, in rubber, neoprene, thermo plastic or similar jacketed cables.

Manufacturer states that this new unit is ruggedly constructed and extremely simple to operate. Both the



self-contained transmitter and receiver (separate units) are powered by standard easy to replace dry cells.

Space is provided in the transmitter's carrying case for the receiver so that complete fault finder can be easily carried, as a unit. Details are given in Bulletin F-38. Joy Mfg. Co.

16—LEAK DETECTOR is for use in closed systems

The new Type H-1 Detector is a redesigned version of an instrument introduced five years ago and declared capable of finding a leak so small that only 1/100 oz of gas will pass through the opening in a year. It is reported to have gained wide acceptance in testing for leaks in refrigerator and air conditioning system, tanks, boilers, piping and other equipment that must be leak proof and into which a halogen gas can be introduced as a tracer.

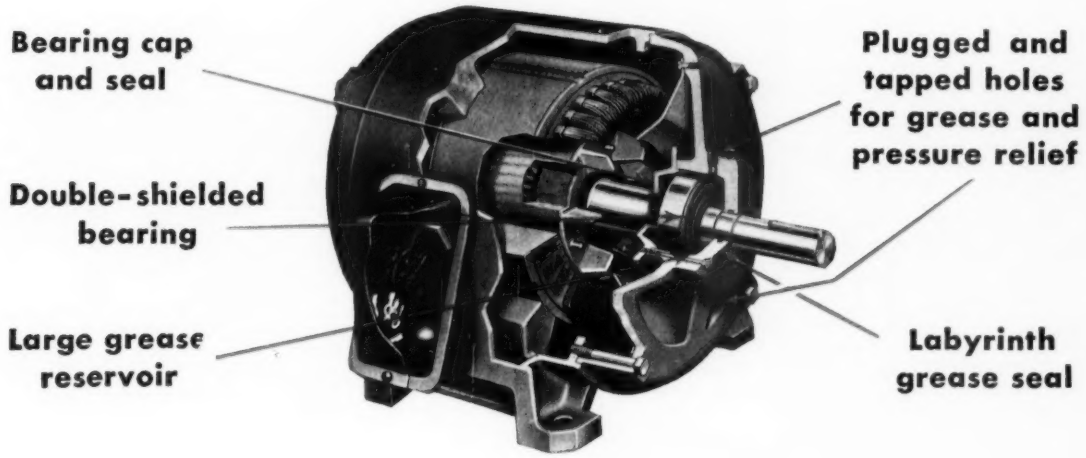
In the new Type H-1, a loudspeaker has been built into the control unit for audible indication of leaks, and an automatic balancing circuit is incorporated to compensate for changes in background air contamination And in the control unit is a new lightweight internal voltage stabilizer. The former model required an external voltage stabilizer.

The new detector retains several features of the former model, including earphone plug and instrument indica-

Here Are Facts You Should Know About Electric Motor Bearings

An ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.


Bearing cap and seal
Double-shielded bearing
Large grease reservoir
Plugged and tapped holes for grease and pressure relief
Labyrinth grease seal

Which is the Best Design for *Your* Application?

But, we believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

The Allis-Chalmers standard design consists of a prelubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make relubrication desirable, it can be done as part of the normal lubricating-routine without dismantling the motor.

The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

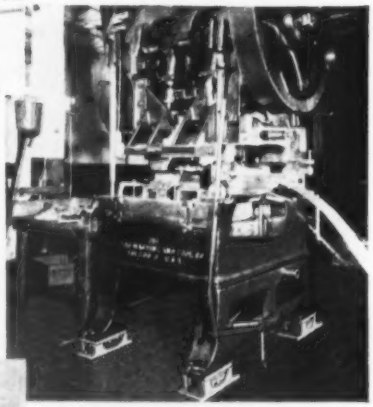
For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor. A-4130

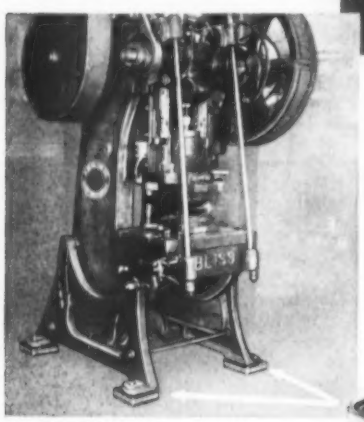
ALLIS-CHALMERS

For more facts circle 563 on Reply Card

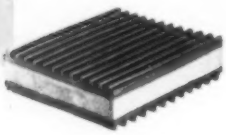
STOP VIBRATION with KORFUND VIBRATION CONTROL

A TOUGH PROBLEM solved by specially designed Korfund Steel Spring Vibro-Isolators. Shock from this 100,000#-600 ton capacity press was cracking building walls. Four specially designed 25,000# capacity Korfund Steel Spring Vibro-Isolators, themselves weighing 600# each, were installed under the press. Building damage stopped and heavy production schedules were maintained. Yet, the price of the special Korfund Isolators was less than 3% of the press cost.





AN AVERAGE PROBLEM—typical of those solved every day by Standard Korfund Steel Spring Vibro-Isolators. Vibration and noise from this double crank press, which could be felt and heard throughout the building, were stopped by Standard Korfund Steel Spring Vibro-Isolators. More and more manufacturers are discovering how Korfund Vibro-Isolators permit press installation without reinforcement of floors, permit press installation *anywhere* (even near precision equipment) for better plant layout, increase press speed and production, improve quality.



A SIMPLE PROBLEM solved inexpensively and *effectively* by Korfund Elasto-Rib Pads. In this case, Elasto-Rib Pads installed under each of the legs of this press stopped transmission of vibration and noise. For the less critical installation, Korfund Elasto-Rib Pads provide low-cost, *effective* vibration and noise control, and eliminate bolting to the floor.

PUNCH PRESSES are notorious for the amount of vibration and noise they transmit—yet in the three cases illustrated, Korfund Vibration Control units successfully solved the problem. In our files are scores of case histories describing equally satisfactory installations on many other types of machinery.

A selector chart is available giving recommendations for various vibration control problems. Write for your copy of Bulletin No. 13, or see our catalog in Sweet's Files.

For specific recommendations, contact us or the Korfund representative you'll find in most principal cities. A half-century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-35R Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

For more facts circle 564 on Reply Card

NEW PRODUCTS

(Begins on page 106)

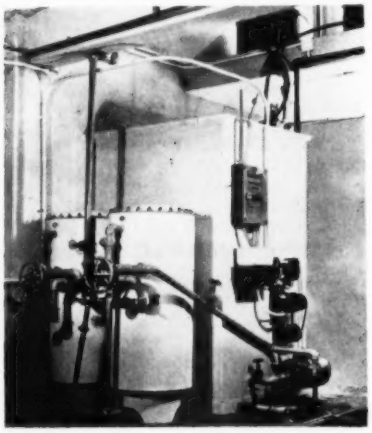
tion of leaks. Now, however, leak indication can be simultaneously indicated by dial, earphone attachment or loudspeaker. The equipment consists of a pistol-like sniffer and a 17-lb control box. General Electric Co.

Use the Reader Service Cards on pages 35-36 and 133-134 to ask for more information on these products. Circle item numbers of products in which you are interested.

17—WATER CONDITIONER is versatile package unit

According to manufacturer of these package water conditioners, the units may be used without alterations: (1) to remove turbidity, color and organic matter from water supplies; (2) to chlorinate; (3) to remove bad tastes and odors; (4) to remove iron and manganese; (5) to neutralize; (6) to soften and (7) to de-alkalize.

The plant, as a complete package,



forms an extremely versatile and self-contained unit which is available in eight standard sizes ranging from 500 to 3,300 gph and flows of 12,000 to 79,200 gallons per 24 hours. Larger capacities can be furnished on request. The Permutit Co.

18—FHP V-PULLEYS designed for easy assembly

New QD (Quick Detachable) Junior Fractional Horsepower V-Pulleys incorporate many of the advance design features of manufacturer's taper hub for heavy-duty QD sheaves.

Basic improvements are centered about a flanged type split taper bushing permitting the hub to grip the shaft and still allow easy assembly and removal. The pulley is now a simple two-piece assembly, drawn together by three slotted hex-head machine screws.

NEXT TIME...ORDER SCOTTISSUE TOWELS!

1. They drink up water like an Airedale in August
2. They're strong — even when soaking wet.
3. They're so soft that many people use them as face cloths.
4. They're clean and white — of course.
5. They're double-fold to dry double-quick.

"EVER PLAY GUESS THE WEIGHT?"

ScotTissue Towels have an exceptionally high fibre content. This "bulk," plus generous size and double fold, makes a case of 3,750 ScotTissue Towels weigh 46 lbs.* Some paper towels cost less for 3,750 but are 10 to 20 lbs. lighter*—hence less drying power. Write for more facts. Scott Paper Company, Chester, Pa. Dept. H.

*Shipping weight

SCOTTISSUE **TOWELS**

Symbol of the right kind of washroom

"ScotTissue," Reg. U. S. Pat. Off.

For more facts circle 565 on Reply Card

This NEW METHOD DRIES AIR

PRECISELY as you want it

- to control your product's quality
- to prevent condensation on your product or material
- to prevent changes due to moist air in contact with your product
- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
- to pack or store your product safe from moisture damage
- to get exact moisture control for the precise atmosphere condition you need
- to provide precise atmospheric conditions for testing
- to increase your air conditioning capacity
- to DRY large quantities of fresh air from outdoors

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

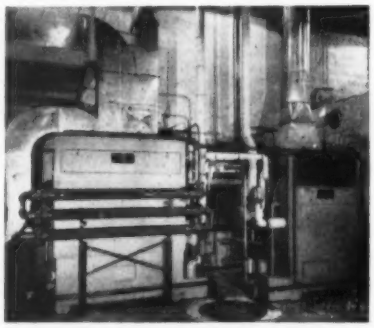
Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



Niagara Controlled Humidity Air Conditioning

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

For complete information write

NIAGARA BLOWER COMPANY

Dept. PE, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of United States and Canada

For more facts circle 566 on Reply Card

NEW PRODUCTS

(Begins on page 106)

Two additional tapped holes allow removal of the pulley from the hub by using the assembly screws as jack screw to break the cone grip. Assembly or removal may be performed with a screwdriver or a wrench. The new design utilizes one common hub for the complete range of pulleys from 3.5 in. P. D. to 15.4 in. P. D with a bore range of ½ in. through 1¼ in. by 1/16 in. increments. The larger sizes in the line have distinctive "I" beam arms to give more strength with less weight. Mechanical Power Transmission Div., Worthington Corp.

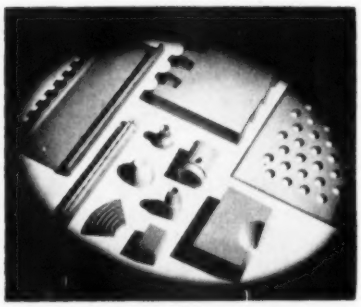
19—SOLVENT DEGREASER with fast cleaning action

This degreaser is described as a highly concentrated product containing no toxic chlorinated solvents, and as practically non-toxic and non-inflammable and safe to use without special safety clothing or ventilating equipment. Manufacturer suggests it for all degreasing and cleaning operations, pointing out that it acts and dries quickly, is well suited for use where speed is essential and particular efficient for cleaning electric motors because it has no adverse effect on electrical insulation. Packaged in 5- and 55-gal drums, this product is announced as low in cost, economical to use. Brulin & Co., Inc.

20—INDUSTRIAL CERAMIC can take rapid heat changes

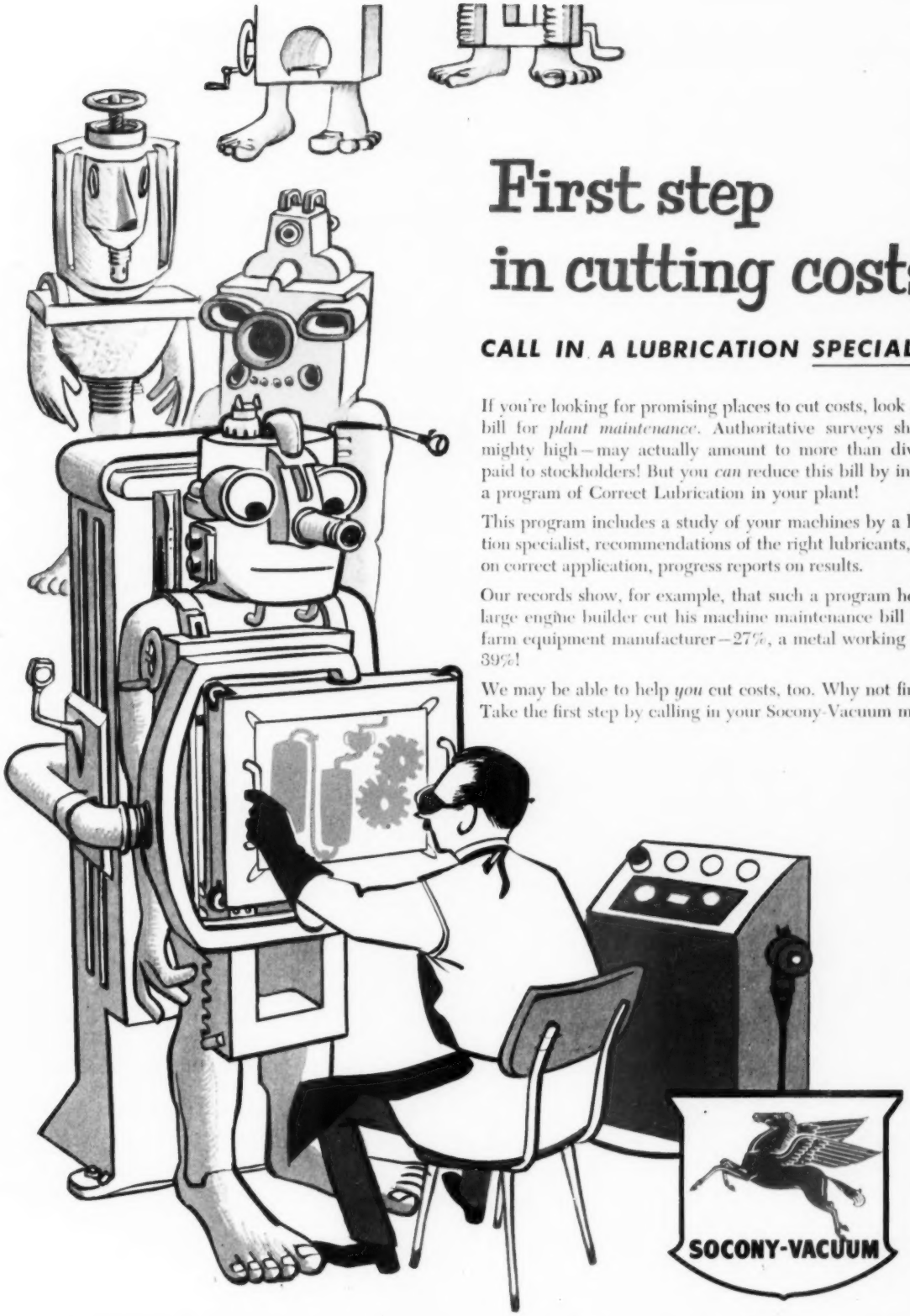
A new ceramic, AlSiMag 539, is finding many industrial uses. It is said to be excellent for fixtures, jigs and work holding devices for fast production line handling of brazing, welding, electronic heating, flame polishing; also for making pins, pads, spacers and kiln furniture for high temperature sintering.

This ceramic is a relatively fine grained silicon carbide material. Due to the difficulties of machining this



highly abrasive material, there are some limitations on the manufacture of complicated shapes.

Where high temperatures are involved or where rapid thermal changes occur, this material has superior properties. It has been repeatedly heated white hot and quenched in dry ice



First step in cutting costs...

CALL IN A LUBRICATION SPECIALIST!

If you're looking for promising places to cut costs, look at your bill for *plant maintenance*. Authoritative surveys show it's mighty high—may actually amount to more than dividends paid to stockholders! But you *can* reduce this bill by installing a program of Correct Lubrication in your plant!

This program includes a study of your machines by a lubrication specialist, recommendations of the right lubricants, advice on correct application, progress reports on results.

Our records show, for example, that such a program helped a large engine builder cut his machine maintenance bill 24%, a farm equipment manufacturer—27%, a metal working plant—39%!

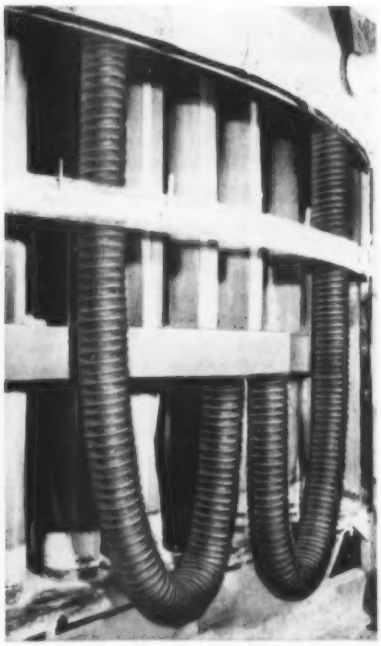
We may be able to help *you* cut costs, too. Why not find out? Take the first step by calling in your Socony-Vacuum man!

Socony-Vacuum *Correct Lubrication*

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

For more facts circle 567 on Reply Card

Maintenance Engineers responsible for dust and fume removal — air handling should know about — SPIRATUBE®!

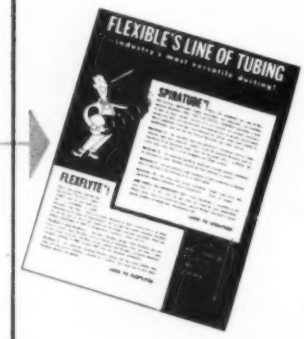


You're missing a good bet, if you haven't discovered the many advantages of Spiratube for all ducting systems. Lightweight Spiratube, the flexible ducting, costs less to install in both dollars and production down-time, for *you can install it yourself* — move it where you need it! Spiratube connects quickly and easily to present lines — bends anywhere. No turn is too short, no angle too acute. No elbows or special fittings to bother with in going around obstructions.

Standard sizes with various fabrics and coatings for all requirements are immediately available from well-stocked distributors — coast-to-coast.

SPIRATUBE application in traveling blow ring assembly at B. F. Goodrich Chemical Company Plant, Louisville, Kentucky.

write today for full details on Flexible's amazing cost-saving ducting



Flexible Tubing CORPORATION

Guilford, Connecticut Pasadena 1, California

For more facts circle 568 on Reply Card

NEW PRODUCTS

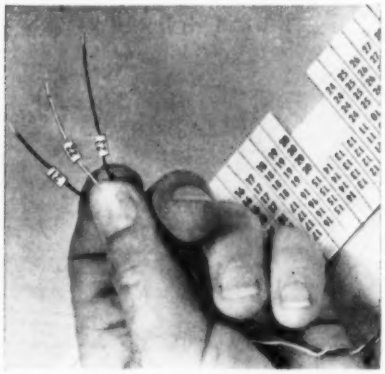
(Begins on page 106)

without fracturing, company reports. Test discs of this material are offered. American Lava Corp.

21—SMALL MARKERS are for coding those small wires

Designed especially for coding small gage wires on electrical and electronic equipment, small component parts and test equipment, E-Z Code Markers are practical and easy to use.

Only ¾ in. long the new markers are center die cut and mounted on a handy pocket size backing card (2 by



10 in.) with easy to use speed tabs for quick removal. The unique speed tab arrangement makes it possible for any code to be stripped off without disturbing the remaining codes. Use of new, small size numerals makes wire identification fast and easy; complete code can be read without turning wire.

Currently available in over 1,000 codes including A.S.A. and NEMA specifications, these new small gage wire markers can be ordered to meet individual coding requirements. Western Lithograph Co.

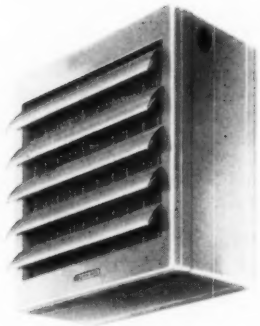
One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

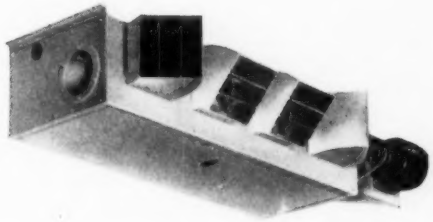
22—CERAMIC COATING acts to protect metals

Use is made of a series of ceramic coatings in the Solaramic Process. The method is a new means of conserving strategic materials and extending metal life at high temperatures. Originally developed for aircraft engine purposes, the coatings are now available for civilian industrial purposes.

A sample folder demonstrating the dramatic results obtainable by coating alloy steel subject to high temperature service with solaramic coatings is now available. Three samples of Type 321

Whether you heat Over Head...





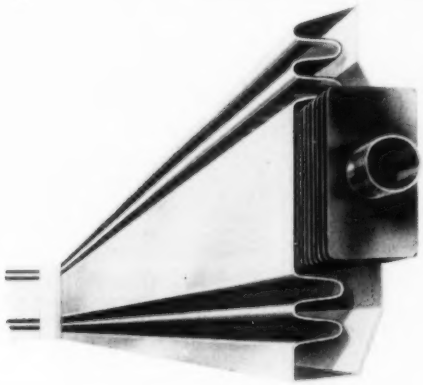
FOR SHIPPING AND RECEIVING DOCKS OR FOR SPOT HEATING

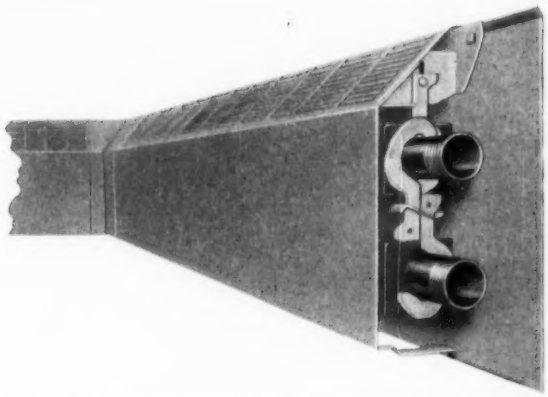
Dunham Propeller Fan Unit Heaters are available in a full range of sizes and capacities . . . in both horizontal and vertical discharge types . . . for steam and hot water. Cast bronze, non-corrosive header gives extra years of service. Slow speed fan, resiliently mounted motor, tight yet adjustable louvers assure quiet operation.

FOR LARGE AREA AND WAREHOUSE HEATING AND VENTILATING

Dunham Blower Unit Heaters move large volumes of air quietly, accurately, efficiently. Maintain perfect balance between air temperatures and velocities. All working parts removable. Five different types of mountings. For steam or hot water. Nozzles, dampers, filters, duct connections available.

Or heat Along the Wall





FOR GENERAL AND EXECUTIVE OFFICES

Attractive Dunham Baseboard Radiation is easy to install with frame or masonry construction. Heavy gage front section clips onto back section, fits flush with floors, permits wall-to-wall carpeting. No "cleaning under" problems. Unique design completely conceals heating fins, pipe and piping connections. Can be painted. Full line of accessories.

FOR PRODUCTION AND ASSEMBLY LINE AREAS

Dunham Fin-Vector Radiation is the ultimate in low-cost along-the-wall heating. Easy to install, any height 4 inches from floor. Light weight, requires few supports, little on-the-job cutting. Exclusive hook-and-link hanger saves installation time, trouble. Three cover designs: Sloping Top, Flat Top, Expanded Metal Top—for 1, 2 or 3-tier installations.

you can depend on DUNHAM

FOR ALL YOUR HEATING EQUIPMENT NEEDS

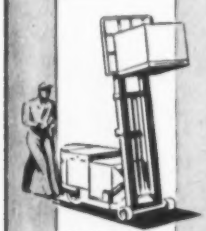
C. A. DUNHAM, 400 W. MADISON ST., CHICAGO • TORONTO • LONDON

For more facts circle 569 on Reply Card

Hedrich-Blessing Photograph, courtesy of the EDWARD HINES LUMBER CO.

CLARK Electric Fork Trucks

CLARK Attachments



CLARK POWRWORKERS

1903 1953
FIRST FIFTY YEARS
CLARK EQUIPMENT

THERE ARE A LOT OF GOOD TRUCKS on the market, and a lot of good arguments for each. But this fact remains: *more people buy CLARK gas powered trucks than any other make.* Since we produce *all* power types . . . gas, electric, diesel and L.P. gas . . . we feel we're in a good position to explain why:

CLARK Horsepower Is Capacity-Rated To Your Requirements —Why pay for excess horsepower that you'll never use? CLARK gives you five engines, rated according to truck capacity. You get plenty of power for the job, without a lot of gas-consuming excess. When you buy a CLARK in the size that's right for you, you get the proper horsepower, too.

CLARK Flexibility Meets Any Work Condition — A wide range of speeds and a constant source of power enables your gas powered CLARK to handle any work condition. Flexibility means 'round-the-clock performance of normal operations, with a built-in reserve of power for peak loads and emergencies. And for long hauls, you can't beat the speed and economy of the gas powered CLARK. . . . . .

No matter what your handling requirements are—there's a CLARK machine to do the job. Electric or gas powered fork trucks, POWRWORKER hand trucks, industrial towing tractors—they all give you quality-value for your money. That's why industry buys more CLARKS than any other make of truck. When you're in the market for materials-handling equipment, talk to your local CLARK dealer first. Most people do!

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS FORK TRUCKS
AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 98, MICHIGAN

Please send: ☐ Condensed Catalog ☐ Have Representative Call ☐ Driver Training Movie

Name_____

Firm Name_____

Street_____

City_____ Zone_____ State_____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

For more facts circle 570 on Reply Card

NEW PRODUCTS

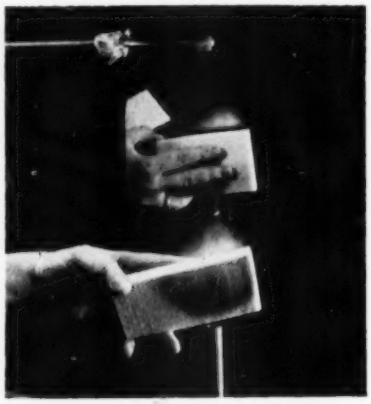
(Begins on page 106)

stainless steel are included. One sample has been solaramic-coated, but not used. The second sample, half-coated and half uncoated, was subjected to 10 hr of hot corrosive gases at 1750 F. The third sample, coated, was subjected to 150 hr of corrosive gases at 1750 F., a treatment which would destroy uncoated stainless, manufacturer points out. Solar Aircraft Co.

23—SILICONE RESINS can be foamed into place

Silicone resins can be expanded to form uniform, unicellular structures weighing only 8 to 24 lb per cu ft. Such structures have been exposed to temperatures of 700 F for over 20 hr with very little structural or dimensional change. Tests are reported to show that silicone foam will retain its physical properties for long periods of time at temperatures in the range of 500 F.

Sections only half an inch in thickness can be brought to a red heat over a direct flame without softening or



showing significant decomposition it is noted. Excellent thermal insulating properties are indicated by the fact that only a slight warmth can be felt on the opposite face of a half inch slab of silicone foam held over an open flame.

These properties suggest the use of "sandwich" constructions, reinforcements foamed in place, or parts machined from blocks of silicone foam in such applications as: fire-walls; thermal, electrical, and acoustical insulating bodies; and heat-stable buoyant structures. Dow Corning Corp.

24—HOPPER MAGNET is easily cleaned and replaced

This unit is for use in hoppers, floor openings, vertical closed chutes and wherever space limitations prevent the use of larger equipment for the removal of iron contamination from free-flowing materials. It consists of a series of 1-in. dia stainless steel tubes within which are powerful Alnico V magnets. These tubes are spaced on 2-in. centers allowing a clear area of

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 1 | AUGUST 1953 | Number 4

Coal Washer Maintenance Costs Cut in Half

Maintenance costs on the coal washer for a big steel plant were running as high as $18,000 a month when Bill O'Brien, Hall field engineer, was consulted. The main trouble in the washing process arises when iron pyrites in the coal come in contact with air and water. Sulphuric acid is formed, and plays hob with the equipment. Drawing on his experience with similar situations, Bill prescribed treatment of the wash water with Banox* corrosion inhibitor. Maintenance has already been cut in half, unscheduled shutdowns have been eliminated, and further improvement can be anticipated.

Water is your industry's most important raw material. Don't waste it.

Epsom Salt Sales Boom in West

Hall-man Hankison of Denver reveals what associate W. C. Bennett did to keep a client happy.

A new 1500 psig boiler filled with raw water required fast silica reduction. No magnesium compounds were available at the plant for the purpose, so Bennett went to a drugstore and asked the clerk for five pounds of Epsom Salts. The clerk looked startled, the order was repeated, and the sale made.

Only five pounds wasn't enough. So the next evening he returned to the drugstore for an additional five pounds.

This was too much for the clerk, who braced himself firmly, looked Bennett squarely in the eye, and said explosively, "What FOR?"

Lamme Medal Awarded Dr. Hall

The Benjamin G. Lamme medal, one of Ohio State's top honors, was awarded to Dr. Ralph E. Hall at the spring quarter commencement exercises. Dr. Hall received the award for meritorious achievement in engineering.

Said the Ohio State Lantern in announcing the award, "Not only is Dr. Hall credited with the development of water conditioning into an exact science based on sound scientific principles, but his contributions to the entire power industry are considered invaluable. Today the Hall system of boiler water treatment is practically standard throughout the world."

From its founding in 1926, until his retirement in 1950, Dr. Hall was director of Hall Laboratories. He still serves as a consultant to Hall Laboratories on both research and development problems in their work as water consultants to industry.

Dr. Hall is the author of 64 papers, and some 54 patents have been issued on Hall processes. He is a member of the American Chemical Society, the American Society of Mechanical Engineers and two national honorary societies, Phi Beta Kappa and Sigma Xi.

Report Shows Scope of Hall Service

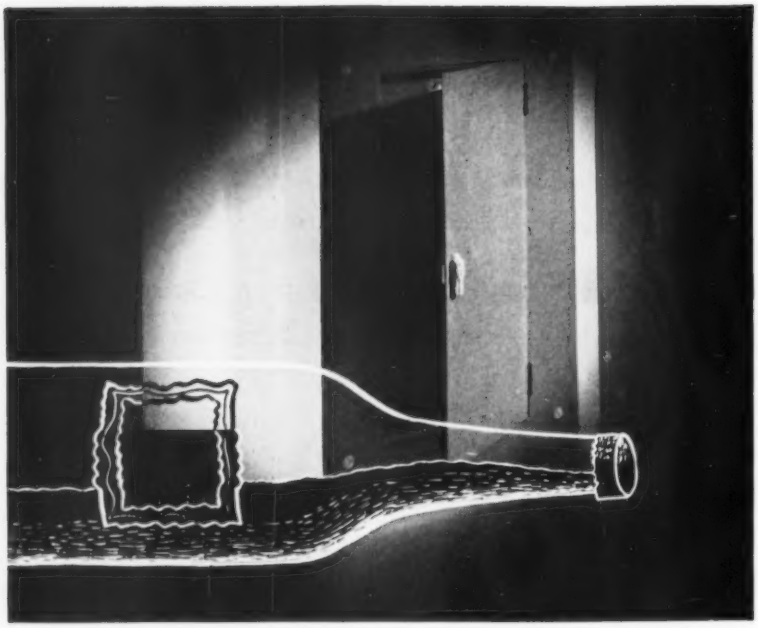
The following extracts from a recent report of Basil Welder, Hall Service Engineer, demonstrates what is meant by "Hall Plant-Wide Water Service." The Hall Service Engineer is not only informed on industrial water but is also alert to the many factors of operation and layout which affect results.

- Persuaded steel plant to make mechanical changes in open-hearth door frames to improve cooling.
- Located leak of clay slip into condensate return system of ceramic plant.
- Introduced Hagafilm* for control of corrosion in condensate return system of glass plant.
- Established system for treating water in five air-conditioning systems in large department store.
- Recommended special filter to plant manufacturing compressed gases, reducing oil in condensate to insignificant level.
- Used Burosil* in boilers of synthetic-fuels laboratory to get rid of sludge through precipitation of magnesium.
- Prepared survey of alternative systems of primary treatment of feedwater for new boilers of steel plant.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems, for information, write, wire or call Hall Laboratories, Inc.

*"Banox," "Hagafilm" and "Burosil" are registered trademarks. "Hall System" is registered as a service mark by Hall Laboratories.



Your panelboard may be your bottleneck

YOUR branch circuits may be wired for 30 or 50 amperes, but do you *really* get that power through your panelboard? Do you have frequent power interruptions during periods of high production . . . particularly in hot weather?

Plant engineers are breaking this nuisance bottleneck by replacing with HEINEMANN Circuit Breakers. The current carrying capacity of HEINEMANN Circuit Breakers does not vary with temperature; nor do the set tripping points. De-rating is never necessary . . . 50 amperes means 50 amperes of usable capacity in your branch circuits. There is never nuisance tripping with the accompanying costly production delays.

HEINEMANN Circuit Breakers operate on a hydraulic-magnetic principle. They provide inverse time delay to allow for starting inrush and harmless, momentary overloads . . . yet they provide the fastest circuit interruption available on large overloads or short circuits.

HEINEMANN Circuit Breakers pay for themselves in another way, too: They have low wattage loss which reduces the current consumption in the panelboard itself . . . a considerable long-term saving.

don't use heat ...USE POWER

Write for Bulletin 3101.

HEINEMANN ELECTRIC CO.

128 PLUM STREET • TRENTON 2, NEW JERSEY

For more facts circle 572 on Reply Card

NEW PRODUCTS

(Begins on page 106)

1 in. between the tubes at the narrowest point. A steel grill serves as a baffle to slow down materials traveling too fast and to direct the stream of material onto the magnetic tubes.

When the grate is ready to be cleaned of its tramp iron load, the grill is lifted from its working position and the tubes wiped off with a cloth or blown with compressed air. Standard dimensions of the grate magnets are in increments of 2 in. on the width starting with 2½ in. and through 36½ in.; length starts at 4 in. in increments of 4 in. through 36 in. Eriez Mfg. Co.

25—"DIAGNOSTIC" TOOL for mechanical troubles

Here is a handy new tool for locating and diagnosing mechanical troubles through the medium of sound.

The Serviceman Soundscope is claimed by manufacturer to be an excellent time and money saver in detecting and "pin pointing" imperfections in all types of mechanical equipment. The sounds of leaking valves, defective bellows, wrist pin and bearing knocks, piston slaps, grinding gears, valve noises, turbulence and other mechanical difficulties can be detected and identified.

The equipment consists of a comfortable ear-piece containing a sound-box system and transmitter, with a sensitive diaphragm capable of picking up sounds which cannot be heard by the ear, and amplifying them until audible.

Simple, compact, and easy to use, this instrument comes packed in a plastic case. Jas. P. Marsh Corp.

26—FOOT SWITCH affords easy access to terminals

New type MA foot switch with several new features of general interest is now in production. Internal switching action has been improved by using a long-life, SPDT "du.op" limit switch.

Access to the internal switch terminals is greatly facilitated by simply re-

moving the front end of the new two-piece top casting. Actuating treadle built into the top of the foot switch

Walworth manufactures a *complete line* of Gate, Globe, Angle, Check, and Lubricated Plug Valves, made of Stainless Steel, Steel, Iron, Bronze, and Special Alloys in a wide range of sizes and temperature-pressure ratings.

Fittings of steel, iron, and bronze are also manufactured in all conventional types and sizes.

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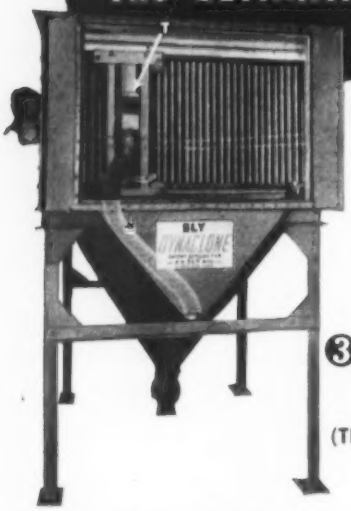

❶ CONSTANT SUCTION
AT DUST SOURCES

❷ SELF CLEANING
FOR CONTINUOUS OPERATION

❸ NO AUXILIARY MOTORS OR BLOWERS
(THE MAIN OPERATING FAN DOES THE CLEANING)

❹ NO ABRASION OF BAGS BY THE CLEANER

The traveler (T) is open to atmosphere by means of a 4-inch flexible hose. As the traveler contacts the open end of each bag, the negative pressure which exists in the dust chamber draws a blast of air (from the atmosphere) through the bag to thoroughly clean it.

Each bag is cleaned, on an average, once every five minutes, thereby assuring uniform suction at dust sources.

The Dynaclone has now been in operation in many different industries for the past three years. More than half of present orders are from the same customers.

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SLY PIONEERS & LEADERS in INDUSTRIAL DUST CONTROL

For more facts circle 574 on Reply Card

NEW PRODUCTS

(Begins on page 106)

requires unusually light foot pressure, and permits fast operation with minimum fatigue. Cable enters the switch through the front by means of a BX connector or a rubber grommet, as specified. Mounting is by means of holes in housing. General Control Co.

27—FLOW METER measures the free-flowing solids

Designed particularly for measuring free-flowing solid materials such as grain, dry chemicals, flour and other cereal products, the Massometer is now in production. It measures the mass rate of flow by determining the torque produced in accelerating the flow. Torque is measured by a pneumatic force-balance system and conventional pneumatic receivers indicate, record, and totalize the rate of flow in pounds per minute.

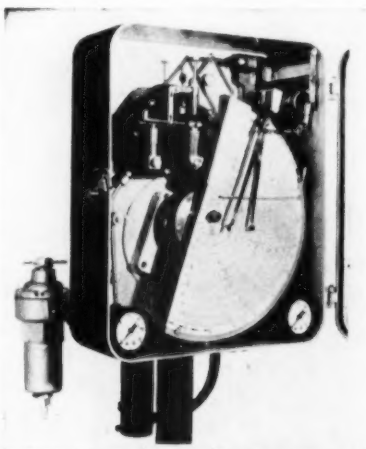
Maximum capacity of the present model is 225 lb per min. Accuracy is given as ± 1 per cent from 10 to 100 per cent of capacity.

The small size of the unit, 24½ in. high by 26 in. wide overall, permits easy installation in tight quarters. It is arranged for pipe stand mounting. Inlet and outlet are fitted for 5 in. dia spouts. Wallace and Tiernan.

28—DIFFERENTIAL CONTROL for change-over valves

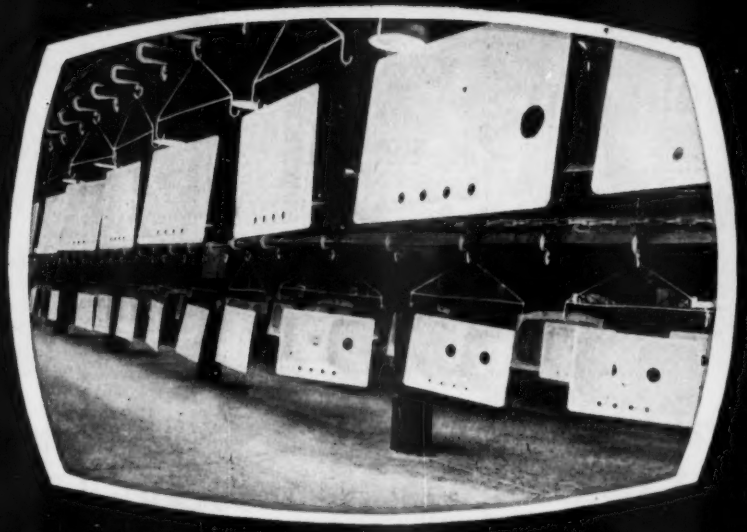
This new differential controller has been designed for orifice meter measuring stations where a wide variation of flow conditions is encountered. It offers, the manufacturer claims, an easy, positive and economical means of automatically turning an additional measuring unit into the line when needed and shutting it off when not needed.

The differential control unit is



mounted in the orifice meter case, offering a compact unit of rugged construction and assured accuracy. The orifice meter which actuates the differential control mechanism also serves as the primary measuring unit. Shutoff

telling the story of 'dag' dispersions



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Does your present lubricant adhere to, and become an integral part of, all friction surfaces that move in high temperature? Does it possess almost unlimited durability? Does it provide protection at extreme temperatures to such things as bearings of kiln-car wheels, to oven conveyors, and other devices and appliances which are exposed to burning heat or freezing cold?

If your present lubricant cannot fulfill these varied requirements, then consider one which does: **'dag'** Colloidal Graphite, the ideal *dry-film lubricant.*

Dispersions of **'dag'** Colloidal Graphite in oils, water, volatile hydrocarbons, and resin-solvent combinations give you slick, durable, dry lubricating films. Applied by spraying, painting, or dipping, they won't gum up or break down *at any temperature you are likely to encounter.*

Learn how this versatile lubricant can help you. Write *today* for Bulletins No. 424-22H and No. 435-22H.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

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try 'dag' resin-bonded dry films for permanent lubrication

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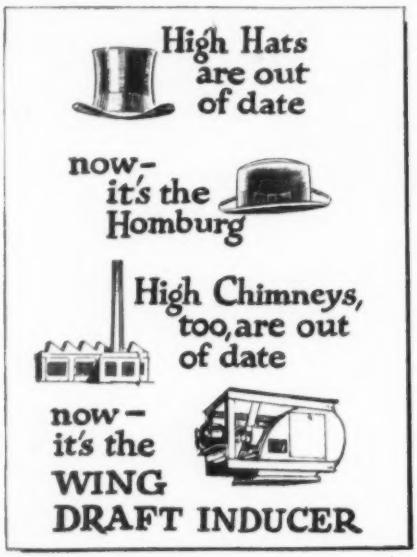
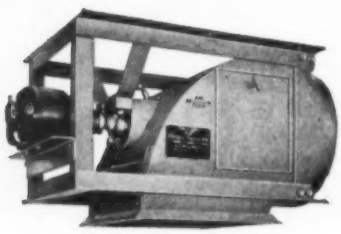
REGARDLESS OF WIND, WEATHER OR LOCATION—AND

WITHOUT TALL, UNSIGHTLY STACKS

BY THE USE OF

WING DRAFT INDUCERS





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- **Exact Draft with Precise Control**
- **Substantial Savings in Maintenance**
- **Ease in Installation**

The advantages of mechanical draft over natural draft are tremendous. Draft produced by stack or chimney is seldom reliable, varying according to weather conditions. The motorized draft inducer makes its own draft regardless of weather conditions or variation in load. The necessity for tall, ugly, expensive stacks is eliminated, permitting the architect to design a more attractive building. Write for a copy of Bulletin I-52.

Wing

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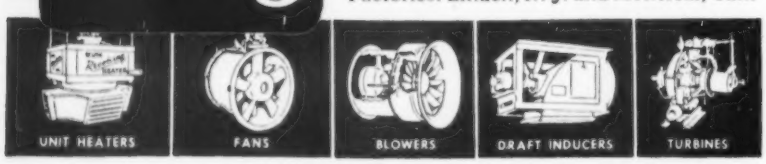
Factories: Linden, N. J. and Montreal, Can.



For more facts circle 576 on Reply Card

NEW PRODUCTS

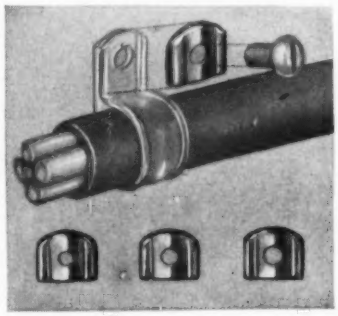
(Begins on page 106)

is obtained through a cylinder-operated valve. As no additional motor valve is required, the amount of equipment is reduced and the housing is small.

To actuate the control unit, a minimum of 10 psi is required and 50 psi to operate the valve cylinder. This supply can be obtained from the line ahead of the valve. Rockwell Mfg. Co.

29—CABLE CLIP WASHERS of cadmium-plated steel

D Washers are specifically designed to be used with manufacturer's ethyl cellulose and nylon cable clips. The shape of the washer conforms to the shape



of the clip and the edges are turned down on all exposed sides, to provide a neatly rounded outside surface. Catalog Sheet D-1 gives data on sizes, breaking strengths. Weckesser Co.

30—WATER SUCTION HOSE is strong, light in weight

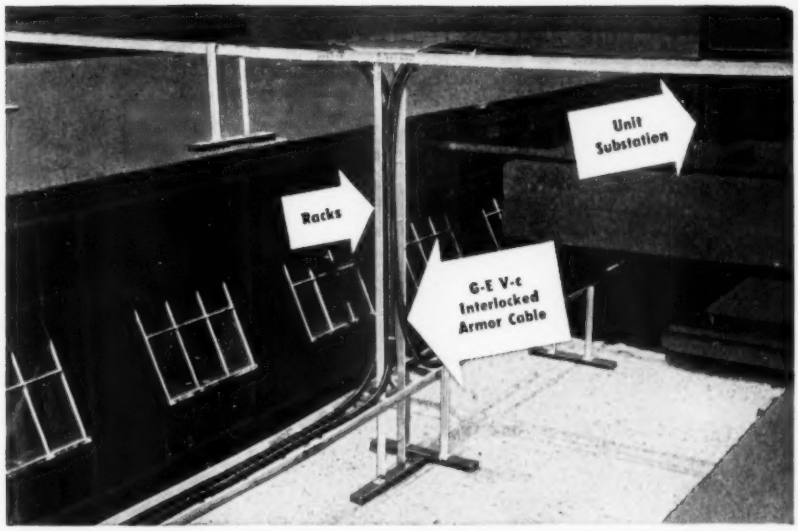
Revolc Water Suction Hose is especially designed for both pressure and suction handling of water. The hose is reinforced with two layers of braided rayon cord, plus a helix of high tensile spring steel wire. The layers of reinforcement are separated by a layer of rubber friction to eliminate internal chafing of the reinforcing cords and wire.

The result is said to be a hose that is light, will not kink or collapse, maintains full opening in any position, and can be grounded to eliminate static electricity. This hose is declared similar to Chernak type suction hose, except that it is more flexible, is stronger, and can be coupled with any type of suction or water hose coupling.

The hose is available in 1¼ to 3 in. ID sizes. Quaker Rubber Corp., Div., H. K. Porter Co., Inc.

It's easy to obtain product data with the postage-free Reader Service Cards. Use them for information and advertised products, too. Just circle the key number appearing at bottom of the ad.

How to Modernize a Plant's Power Supply System in a Hurry



Utilize existing structures... and the G-E V-c INTERLOCKED ARMOR CABLE SYSTEM

To distribute power in a modernized plant, an eastern manufacturer used 12 G-E unit substations on the roof and then installed a G-E V-c interlocked armor cable system to bring high-voltage power to these substations. More than a mile of G-E V-c interlocked armor cable was used. The cable was 3-conductor #2/0, 15,000-volt, No. 1799 varnished-cambric-insulated with a thermoplastic jacket and bronze armor.

Underground duct work would have meant costly tearing up of concrete floors. And an ordinary conduit installation was not feasible because of the uneven contour of the buildings' roofs. Either of these methods also meant more installation time and more cost for materials.

Aluminum racks

Aluminum racks, only 12 inches wide, were used to carry the cable over the many rises, slopes, and bends on the roofs. Because the G-E V-c interlocked armor cable system is light and flexible, no difficulty was experienced in pulling long lengths by hand over and around the bends and angles.

Easy to inspect

G-E V-c interlocked armor cable on racks is always open for visual inspection — always accessible — quickly spliced with simple mechanical joints. To our knowledge, no installation of G-E V-c interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure. It will pay you to investigate the G-E V-c interlocked armor cable system. For more information, write Section **W64-864,** Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Easy to bend.
Corners and projections present no installation problems for the G-E V-c interlocked armor cable system.

ESTIMATED INSTALLED COSTS FOR 15,000-VOLT CABLE

	Conductor Size	Method of Installation	Amperes*	Estimated Installed Cost per 100 Feet per Ampere
Varnished Cambric Insulated Interlocked Armor Cable	**2/0**	**Racks**	**185**	**$2.80**
Rubber-Neoprene	3/0	Steel Conduit	197	4.20
Rubber-Neoprene	1/0	Messenger	182	3.10

*Based on 77 C copper for V-c and 80 C copper for rubber-insulated cables at 40 C ambient.

You can put your confidence in—

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

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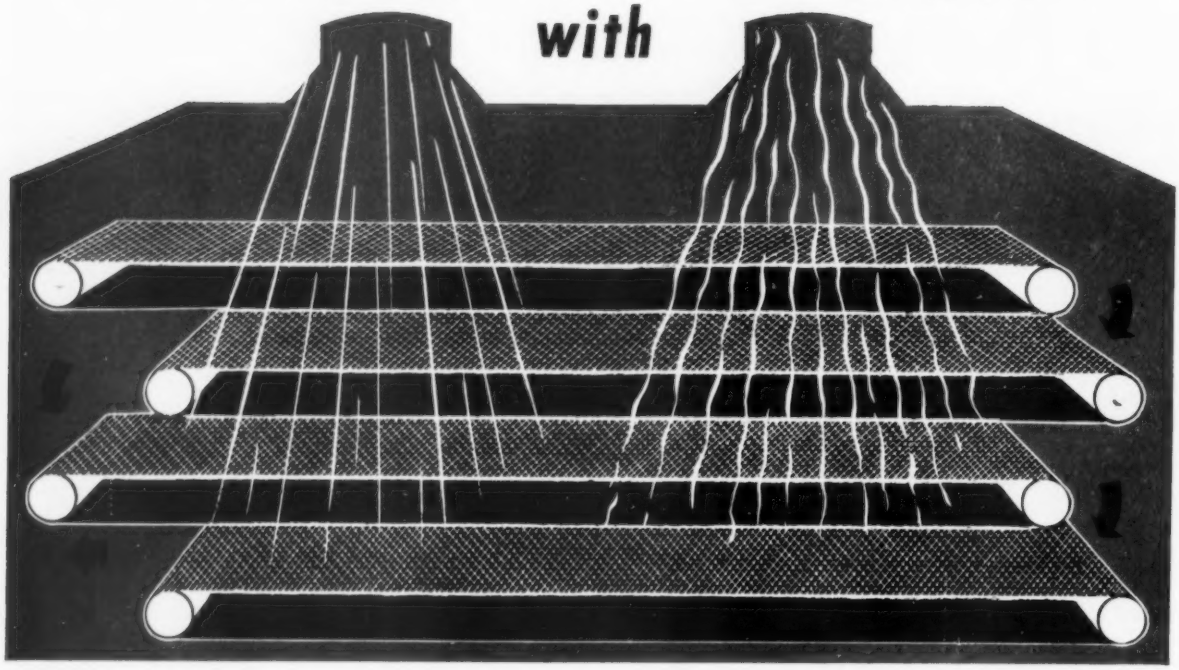
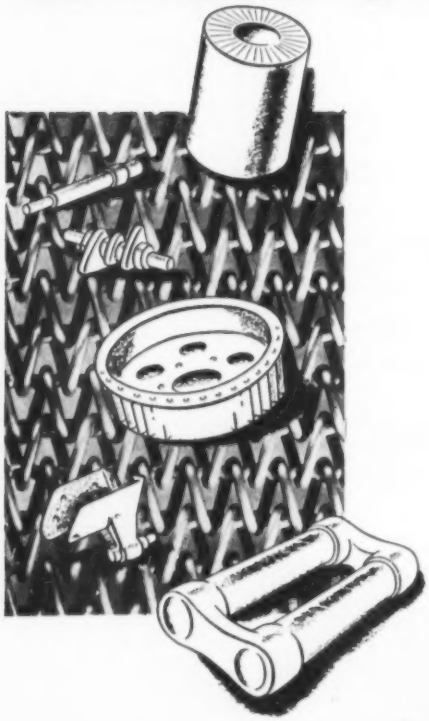
SAVE TIME...SAVE MONEY

on air cooling or air drying jobs with



WISSCO STEEL PROCESSING BELTS



If your processing involves air cooling or air drying, it will pay you to investigate the big savings Wissco Belts can give you by converting time-consuming batch operations into fast, efficient, continuous straight-line production.

With Wissco Belts you get these advantages:

- **Maximum air circulation either hot or cold, any velocity or volume, because of wide open balanced spiral weave.**
- **Corrosion resistance of stainless steel.**
- **High loading capacity because of strong, steel construction.**
- **Simple, low-cost installation; and economy of continuous straight-line operation.**

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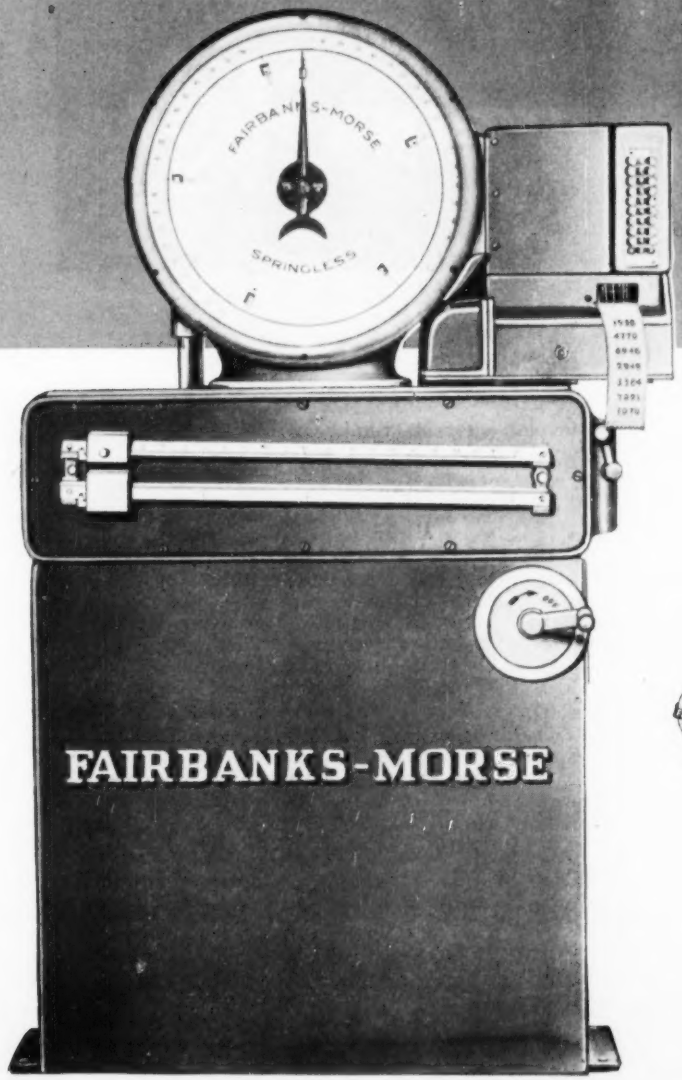

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HERE'S BIG NEWS!

New SPRING-KOTE *Protective Asphaltic Mastics now safely applied to damp surfaces*

Such moisture has no adverse effects whatever upon SPRING-KOTE's tenacious adhesion, nor can it prove harmful in any way to either the surface or coating.

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- **Bonds Securely**
- **Prevents Rust and Corrosion**
- **Waterproofs and Beautifies**
- **Insulates Vessels, Hot or Cold**
- **Resists Chemicals, Alkalies, Most Acids**

Here's a Suggestion: Pick out the toughest tests in your plant for long-lasting SPRING-KOTE. See for yourself how SPRING-KOTE cuts costs.

With justifiable pride, Spring Packing Corporation announces *new* SPRING-KOTE—effective, long-lasting asphaltic mastics containing no flake or crystalline-type fillers. They won't scale, crack, sag, or loosen throughout a temperature range of —40° F. to 450° F., for the amorphous-type fillers used in SPRING-KOTE set up no undesirable internal stresses when drying.

Also new to asphaltic mastics are the precise control of raw materials and the consistent product formulation with give SPRING-KOTE positive uniformity—batch-after-batch; month-after-month. Thicknesses up to ⅜" require no mechanical means for support.

Now, more than ever, SPRING-KOTE saves users time and money. Applied by plant maintenance crews or nearby Authorized Applicators. You'll like the fine job SPRING-KOTE does. Write for complete information.

SPRING PACKING CORPORATION

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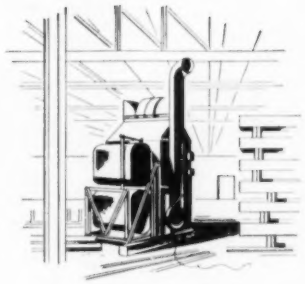
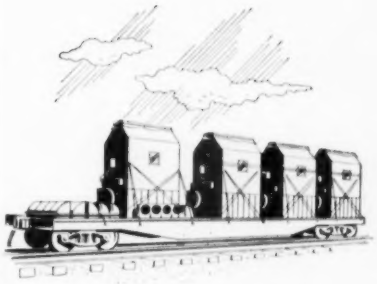
These 12 DRAVO *Counterflo* SPACE HEATERS really got around!

Here's where the Dravo Heater's rugged construction and durability paid off for Ford Motor Company.

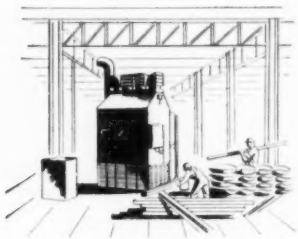
Back in the fall of 1950, Ford purchased 12 Dravo Heaters for temporary heating at Cleveland, Ohio, while Ford's new engine plant was under construction during the winter of 1950-1951.



1 The heaters maintained comfortable working conditions and kept the ground from freezing during zero weather so that concrete could be poured.

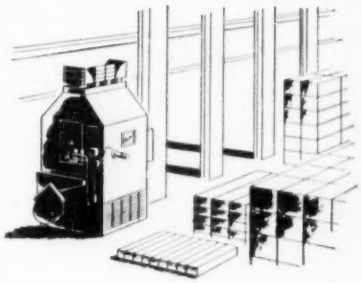


2 After this new plant was completed, four heaters were shipped to Canada and were permanently installed in Ford's warehouse at Winnipeg.



3 The other eight heaters were shipped to Kansas City, Mo., for use as temporary heaters during the construction of facilities similar to those in Cleveland.

4 When that job was finished, the eight heaters were returned to Dravo at Neville Island, Pittsburgh, for overhauling and reconditioning by highly-skilled Dravo personnel.



5 Now these eight Dravo *Counterflo* Heaters have been permanently installed for comfort heating at Ford's assembly plant at Buffalo, New York.

Only Dravo *Counterflo* Space Heaters could stand up under such extraordinary treatment and frequent moving. Dravo Heaters are a product of top-flight engineering and planning; their mill-type, heavy construction means long life, low maintenance and years of satisfactory service.

Dravo Heaters, backed by over 60 years of engineering experience, are available now in a range of sizes from 400,000 to 2,000,000 Btu. Find out how these superior Dravo Heaters can benefit you. Write for more information. Use the coupon.

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ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

1903 • 50 YEARS OF DESIGN LEADERSHIP • 1953

(Continued from page 36)

this bulletin includes construction and performance data, sizes, weights, working pressures and uses. Quaker Rubber Corp., Div., H. K. Porter Co., Inc.

133 **Needle Valves**—Catalog NV-1, 8 pp, describes valves for the fine regulation of water, oil, gas, and other fluids. Text is illustrated by cutaways showing one-piece construction, other design features. Globe and angle types are shown, and sizes given for these throttling and shutoff needle valves of 10,000 psi maximum working pressure. A pressure drop chart is included. Marsh Instrument Co.

134 **Bin Gates, Valves**—Twenty-pp Bulletin 1252 covers manufacturer's line of gates and valves, including the Twistite double closure bin valve and the Moore bin gate. The latter, for heavy duty applications, consists of an apron belt which can be rolled away from the bin opening. Complete details and dimensions are provided. Stephens-Adamson Mfg. Co.

PUMPS

135 **Controlled Volume Pumps**—Motor-driven controlled volume pumps are fully described in 40-pp Bulletin 553. Provides information on the design and construction of the pumps, and includes capacity-pressure selection tables, types of capacity adjustments, standard and special designs and packaged systems. A chart shows typical applications in six major industries, and another chart, in full color, shows construction materials for use with 170 industrial fluids. Milton Roy Co.

136 **High Vacuum Pumps**—Catalog 750, 36 pp, on company's Mirovac pumps for high vacuum, provides tables of formulas, constants and conversions frequently used in vacuum processing; information on continuous oil purification and other maintenance procedures, and tips on pump selection for typical vacuum systems. F. J. Stokes Machine Co.

137 **Screw Pumps**—Now available are two new bulletins on this company's Warren-Quimby screw pumps. Twelve-pp Bulletin S-205 is devoted to standard gear-in-head, high-pressure long body gear-in-head and standard vertical gear-in-head types. Basic construction and design are discussed and sectional views indicate features. Dimensions and specifications are included. Six-pp Bulletin S-206 gives comparable data on double external bearing and hopper types. Warren Steam Pump Co., Inc.

TOOLS, WELDING

139 **Hydraulic Pullers**—Industrial maintenance problems involving removal and installation of gears, bearings, pulleys, sheaves, pinions, shafts, couplings, and tubes are treated in Power-Twin Bulletin HY-1953, 24 pp. Covers use and application of pullers, attachments and adaptors for 17½-, 30- and 50-t hydraulic rams. Also shows puller sets for use with company's center-hole rams. Owatonna Tool Co.

140 **Hydraulic Equipment**—Information on manufacturer's hydraulic jacks, rams and pullers is provided in revised Bulletin 53, 12 pp. Applications photos and pictures of accessories and attachments for hydraulic equipment with capacities of 10 to 100 t are included. Covers remote control pumps and rams, center-hole pullers, foot lift and standard hydraulic jacks. Templeton, Kenly and Co.

141 **Valve Reseating Tools**—This bulletin describes Rex reseating tools for use in valves without removing them from the line. Several sets are listed, with valve sizes ranging from ⅜ in. to 4 in. All parts are described, their uses explained, and prices listed. Deady Chemical Co.

142 **Soldering Irons**—Soldering irons and soldering iron tips for industrial applications are described in 8-pp Bulletin GEA-4519. Photos, diagrams, and tables cover soldering iron construction, application, ratings and prices. Also included is a chart showing the purpose of flux and which flux is best suited to the base material or finish. General Electric Co.

143 **Welding**—This 8-pp article, titled, "Will Inert-Gas Metal-Arc Save Money on Mild Steel" reports the results of weld tests on mild steel with this welding method. Welding data accumulated from these tests are recorded in tables comparing costs with those of conventional method of welding mild steel. Graphs and cross-section photos of weld deposits are included. Air Reduction Sales Co.

144 **Stainless Welding Guide**—Eight-pp Bulletin GET-1955, titled "Welding and Metallurgical Aspects of Stainless Steels," serves as a practical guide for welding stainless steels. Covering the three classifications of stainless steels, martensitic, ferritic and austenitic, each of these is discussed completely in its reactions to heat and welding. General Electric Co.

LUBRICANTS, LUBRICATORS

145 **Lubricants, Fittings and Methods**—Bulletin V-220, 12 pp, describes three major types of lubricants. A selection chart indicates specific lubricants for a large number of chemicals. A special feature of the bulletin is an illustrated outline of the three functions of a lubricant in company's valves. A new combination button head fitting and lubricant screw is illustrated. Includes instructions for servicing valves. Rockwell Mfg. Co.

146 **Extreme Service Lubrication**—Industrial grades and compositions of Molykote lubricants are described in 8-pp Bulletin 100. Technical information on each grade is listed—for extreme pressure lubrication, extreme temperature lubrication, dry powder lubricant, grease consistency lubricant, and suspended dispersions of lubricant particles in various vehicles. Prices are included. The Alpha Corp.

147 **Force Feed Lubricators**—Twelve-pp Catalog 25 G describes and pictures company's new Model 25 lubricator, a popular priced, general purpose unit adaptable to many applications. Lists machines for which it provides economical, automatic lubrication. Discusses drive arrangements available, gives specifications, sizes. Manzel Div., Frontier Industries, Inc.

METALS AND METAL PROCESSING

148 **Properties of Electrodeposited Nickel**—Bulletin A-153 is an illustrated report on the uses of electrodeposited nickel, properties of deposits and variables that influence them, and composition and structure of deposits. It is of interest to users of nickel plating for electroformed shapes, building up worn machine components, and heavy industrial coatings for imparting nickel's corrosion resistance to common construction materials. The International Nickel Co., Inc.

149 **Ductile Iron Properties**—This 12-pp booklet tells brief story of ductile iron produced by company. Three standard grades of Ductalloy are listed, with physical properties described. Photos show industrial applications of ductile iron, and

August, 1953

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PLANT ENGINEERING

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1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50

BULLETINS

101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116
117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148
149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164
165	166	167	168	169	170	171	172
173	174	175	176	177	178	179	180

DATA FILE

201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234
235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251
252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268
269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302
303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319
320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336
337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353
354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590
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621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650
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681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710

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comparisons are drawn between ductile and other forms of iron for specific uses. High temperature properties of Ductaloy are tabulated. The American Brake Shoe Co.

150 Magnetic Iron Powders—Eight-pp, illustrated catalog, 254, gives technical data on magnetic iron powders. Included are photomicrographs, frequency versus Q charts, permeability rating graphs, plus data on the uses and applications of annealed carbonyl iron powders, hydrogen reduced iron powders and magnetites. Magnetic Powders, Inc.

153 Copper and Corrosion—Information gained from years of research into the nature of corrosive attack on copper and copper alloys is presented in Publication B-36B, a new 28-pp revised edition of company's booklet, "Corrosion Resistance of Copper and Copper Alloys." Explains chemical and physical nature of corrosive attack in its various forms, and provides a tabulation showing the relative corrosion resistance of the principal types of copper and copper base alloys in contact with some 183 corroding agents. The American Brass Co.

THIS MONTH'S LITERATURE OF MERIT offers data on packings and gaskets . . . uses of ion exchangers . . . plant layout planning

151 Packings and Gaskets—In this 40-pp belting and packing manual (MY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included are packing recommendation charts. New York Belting and Packing Co.

152 Ion Exchangers at Work—Twelve-pp Bulletin 2506 summarizes properties of company's cation and anion exchangers and indicates some of their uses—many of them new. Details a general history of ion exchange engineering, gives data on selection of ion exchangers and lists general applications in the treatment of water and special problems associated with recovery of metals from solution, streptomycin purification, sugar refining, separation of rare earths, and waste treatment. The Permutit Co.

154 Plant Layout Tools—This 32 pp bulletin covers an analysis of plant layout techniques plus a complete listing of materials necessary to do a good job of planning a layout. Discusses such materials as templates, tapes, symbols and models. It also presents case histories and photos of layouts, including a materials handling layout. F. Ward Harman Associates.

155 Zinc Dust—Common applications of zinc dust are discussed in Bulletin 141. Advantages of its use in the manufacture of bleaches, as a reducing agent, as a catalyst, purifier, precipitating agent, additives to grease and other materials for pipe thread lubrication, are cited. Particular attention is given to its use in paints for use on hot surfaces, including flue boxes, smokestacks, steam condensers. Federated Metals Division, American Smelting and Refining Co.

156 Descaling Steel Sheets—Bulletin 914 describes the descaling of steel with steel shot by airless blasting. Presents the case history of a metal fabricator who cut production costs by buying hot rolled sheet and descaling it. Seven savings features of the process are pictured. American Wheelabrator & Equipment Corp.

157 Recirculating Furnaces—Plant engineers concerned with heat processing of metal will find much of interest in 12-pp Bulletin 81. This colorful booklet is profusely illustrated, showing many designs of furnaces in operation on a variety of heat treating jobs. Furnace performance records are given and there are detailed specifications for pot type, batch and conveyor type furnaces. Despatch Oven Co.

158 Industrial Furnaces—This 8-pp brochure contains a photo portfolio of outstanding installations of gas, oil and electric heat-treating furnaces. Illustrations show more than 14 furnace types. Lee Wilson Contracting Co.

MACHINE SHOP EQUIPMENT

159 Improved Grinders—Two illustrated bulletins introduce manufacturer's new grinders. One bulletin covers a unit for precision grinding of all types of modern cutting tools at moderate cost, giving features, specifications and prices on floor and bench models. Similar information is given in the other bulletin on a low priced carbide grinder for wet grinding applications. Thomas Prosser & Son.

160 Duplicating Attachment—Form PT-1100 presents the Pro-Tracer, a simple, inexpensive profile tracing attachment for engine lathes. Illustrates its use in boring, OD turning, shoulder threading, facing and other applications. Stresses versatility quick installation. Lehigh Foundries, Inc.

161 On Electrolytic Grinding—This 10-pp technical report on the grinding of single-point carbide tools with electrolytically assisted diamond wheels covers company's recent experimental work on this method. Gives test procedure and results on studies on the effect of electrolytic erosion on tool performance; rate of cut and diamond consumption; possible toxicity; and electrolytic machining without use of diamond. Generally favorable conclusions are presented, along with cautions to be exercised in the adoption of any of the newer grinding methods at this time. Norton Co.

162 Data on Metal Abrasives—Now available to plant engineers are three technical bulletins offering detailed information on metal abrasives. Bulletin 1 discusses SAE specifications of metal abrasives; Bulletin 2 covers size range and screen tests for metal abrasives; and Bulletin 3 explains importance of average particle size, covering factors relating to particle size that users of shot and grit should consider in checking metal abrasives in their machines. Harrison Abrasive Div., Metals Disintegrating Co., Inc.

163 Abrasive-Belt Grinding—"Wherever There's Industry" is a 32-page book containing 46 case studies on abrasive-belt methods which effected savings on machining operations in a variety of industries. More than 100 illustrations show applications of five different types of abrasive-belt machining. History of the machines and advantages of use are discussed. Portar Cable Machine Co.

FASTENING EQUIPMENT

164 For Faster Stapling—Twelve-pp Bulletin C-201 covers a line of corrugated and fibre carton stapling machines. Illustrates and briefly describes 20 machines,

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including portable, manual, semi-automatic and automatic models. Also covers operation of the retractable anvil stapling head used on the staplers. Explains economies afforded through increased speed of closure. International Staple & Machine Co.

165 Socket Head Fasteners—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel pins. Standard Pressed Steel Co.

166 Wire Stitching—Bulletin AD 130 describes a new method of stitching with wire. Called arcuate, because the machine puts an arc in the cross-section of the flat stitching wire, the process permits use of lighter gage wire in the stitcher. Bulletin describes possible savings in metal and operating costs. Conversion kit, to use arced wire in old machines is pictured and described. Acme Steel Co.

BURNERS

167 Fuel Burning System—A factory-coordinated industrial fuel burning system for the conversion of large boilers to oil or gas firing is presented in 16-pp Form ID-53. Well illustrated, booklet explains what the system is, what it offers. Pictures component parts and stresses installation simplicity, precision combustion afforded. York-Shipley, Inc.

168 Modern Burners—This bulletin covers gas and dual-fuel firing for heating, processing and power. Emphasizes advantages of zone fire control for low start and modulated firing permitted by company's vertical gas burner, also features of the "inshot" type burner with its radiant heat. Also describes dual-fuel package unit. Iron Fireman Mfg. Co.

OTHER EQUIPMENT

170 Filters for Dry Cleaning—How this company's pressure filters for dry cleaning plants can save solvent, speed production and cut costs is explained in Form 488. Air cleanout, mechanical screen scraper and filter screens are described in detail, and seven major advantages of the filters are listed. Butler Mfg. Co.

171 Steam Generators—Data and specifications for completely plant assembled water-tube steam generators are contained in this 8-pp bulletin. They cover nine sizes from 5,300 to 33,000 lb of steam per hour and for pressures up to 400 psi. These units are designed for fully automatic firing with oil, gas, or stoker-fired coal. Superior Combustion Industries, Inc.

172 Adhesives and Coatings—This 12-pp bulletin presents the applications of adhesives, sealers, and coatings in the automotive industry. Adhesive applications for weatherstripping, trim, floor carpet, vinyl trim, sound deadener pads, and acoustical pads are discussed. Liquid and solid sealers for bodies, windshields and back lights, plus weld-through, extruded, and drip rail sealers are covered. Minnesota Mining and Manufacturing Co.

173 Hard Facing Facts—Hard facing, and its value in lowering maintenance and replacement costs, is treated in this bulletin. Describes method of applying hard alloy metal to a low alloy steel base at areas of wear. Shows how operating life of worn equipment is increased by proper use of hard facing. Cleveland Hard Facing Inc.

175 Mechanical-Drive Gas Turbines—Booklet B-5859, 24 pp, on combustion gas turbine power plants for mechanical drive applications points out their uses for natural gas transmission, and in the chemical, refinery, steel mill, and other process industries. The booklet describes four types: 1800-hp, simple open-cycle; 5000-hp, compound open-cycle with regenerator; 5300-hp compound open-cycle; and 7000-hp simple open-cycle. Load diagrams, dimensioned outline drawings, performance curves, and colored cut-away drawings are presented. Westinghouse Electric Corp.

DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 35-36 and 133-134.

HEATING, COOLING

201 Forced Air Space Heaters—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principle and flexibility of application. Advantages of the heaters are detailed. These heaters are direct fired by oil, gas or combination fuels. Dravo Corp.

202 Faster Tank Heating, Cooling—Bulletin IP-250, 8 pp, describes company's Platecoils, embossed metal sheets welded to form compact units through which required heating, or cooling, medium is circulated under pressure. Explains lower costs, faster tank cooling or heating, lighter weight of the units. Kold-Hold Mfg. Co.

203 Heat-on-Wheels for Industry—Illustrated Form 3574, 16 pp, is the story of how manufacturer's portable heaters can solve emergency heating problems. Shows how these heaters provide extra heat for the hard-to-heat spots, and for extra cold areas, to spot heat where needed, and for ventilating, drying and thawing jobs. Herman Nelson Div., American Air Filter Co., Inc.

204 Engineering Data for Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

205 Electric Heaters—Bulletin E-1, 8 pp, describes electric unit heaters and heater sections for general industrial heating as well as for specialized use in heating corners of factories, warehouses. Illustrates overhead downward discharge heaters with revolving and stationary discharge outlets and a heater with horizontal discharge. An electric duct heater section is also described. L. J. Wing Mfg. Co.

206 Heat Transfer Equipment—An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

BOILERS, GENERATORS

208 How Much for Steam—Here's a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

209 Steam Generators—Illustrated Bulletin SB43, 20 pp, describes company's VL factory assembled generators combining 2-drum water-tube boiler, integral water cooled furnace, brick work, insulation and steel casing. A large cutaway illustration shows design details, and gas travel, circulation and furnace interior are also pictured. Use of the generator with various fuels and firing arrangements is covered, dimensions included. Erie City Iron Works.

210 Packaged Steam Generators—This new 16-pp booklet on steam generators is profusely illustrated in color providing photos, cutaway and schematic drawings and describing in detail the construction and operating principles. Explains induced draft, dry steam, four-pass downdraft design, 5 sq ft of heating surface per Bhp, flexibility of operation, and oil, gas and combination gas-oil burning equipment. Superior Combustion Industries, Inc.

212 Re-Circulation Steam Generator—Here's a 6-pp folder introducing a controlled re-circulation steam generator, describing its developments and uses. Combustion Engineering, Inc.

213 Shop-Assembled Boiler—Sixteen-pp Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

214 Steam Generators—Bulletin 1218 on company's Powermaster units for steam or hot water use. Describes high or low pressure units from 15 to 500 hp. Gives details on special burner design and units' ability to be changed from oil to gas firing in minutes. Orr & Sembower, Inc.

PUMPS, COMPRESSORS

215 Installing a Pump—Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

216 Pump Service Manual—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity steam consumption curves, general information on water, properties of steam. Warren Steam Pump Co., Inc.

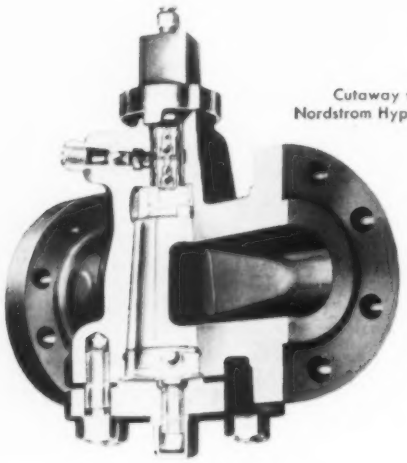
217 How to Solve Pumping Problems—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

218 "A Turn for the Better"—Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

219 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

220 Data on Pumps—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

How much should you spend for valve maintenance?



Cutaway view of Nordstrom Hypreseal valve

In all but the most simple services, *any* kind of valves need *some* maintenance.

Of course the same thing is true with any mechanism where metal rubs metal. Take your car, for example. You lubricate the engine to *reduce* maintenance and save major repair bills. If you don't lubricate it, you save a few dollars on lubricant, but pay the far, far higher costs of part replacement. More important, you'll need a new car much oftener.

Exactly the same principle applies to valves. If you install Nordstrom lubricant-sealed valves, maintenance is generally confined to adding lubricant at intervals. You lubricate to *reduce* maintenance—to avoid the high costs of major repairs, new parts, and shorter valve life. That's the big advantage of Nordstrom valves in the first place.

Over a 20-year period, Nordstrom sales of repair parts have been less than half of one per cent of sales. In several plants in which records were kept and where Nordstrom and other valves were used, repair parts for Nordstrom valves ran about one-tenth of other makes.

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Valve lubrication doesn't *cost* money, it *saves* money. If you'd like to discuss the application of Nordstrom valves for any service, call your Nordstrom representative or write Rockwell Manufacturing Company, Pittsburgh 8, Pa.

ROCKWELL Built
Nordstrom Valves
Lubricant-Sealed for Positive Shut-Off

Another Rockwell Product

For more facts circle 583 on Reply Card

DATA FILE

(Begins on page 135)

221 Compressors, Pumps—Catalog 546, 6 pp, presents company's line of air and gas compressors, Oilfreair and Oilfregas compressors, dry vacuum pumps, aftercoolers, Airchek valves, and centrifugal pumps for boiler feeding and general applications. Includes brief descriptive data. Pennsylvania Pump and Compressor Co.

223 Improved Compressor—How this manufacturer's Spiraxial compressor for air or gas is designed to provide peak efficiencies with minimum servicing is explained in Bulletin SC-152. Construction and design details are discussed in detail. Roots-Connersville Blower.

224 Centrifugal Compressors—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

VENTILATING, DEHUMIDIFYING, AIR CONDITIONING

225 Air Conditioning Cabinets—Engineering Bulletin 3703A, 40 pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling coils. Buffalo Forge Co.

226 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

227 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

228 Vaneaxial Fans—Bulletin J-611 is a 16-pp booklet presenting company's Axivane Series 1000 fans. Explains advantages of vaneaxial design and the versatility afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia., volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

229 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

230 Heating, Air Conditioning Book—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

231 Push-Button Ventilation—Six-pp Bulletin 680 gives sizes, dimensions and performance data on power roof ventilators for flat, curved or peak roof installations, capacities to 78,800 cfm. Cites advantages of ventilation by positive air displacement. Propellair Div., Robbins & Myers, Inc.

232 Fans and Blowers—Illustrated Catalog 21A, 64 pp, gives ordering information

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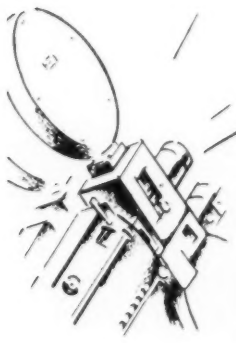

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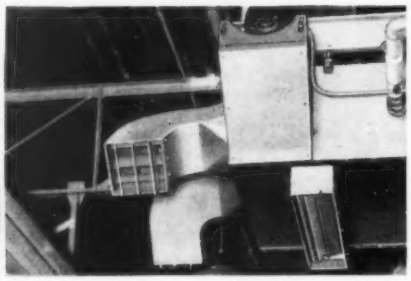

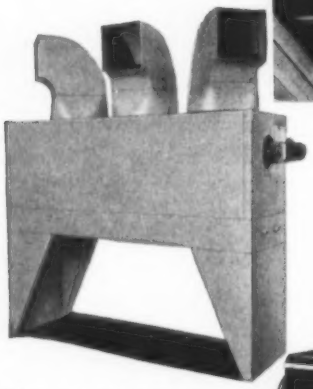

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DATA FILE

(Begins on page 135)

on company's fans, blowers, roof ventilators and related products, including application suggestions, ratings, dimensions. Explains principle of curved orifice air-seal ring incorporated. Provides directions for installation and operations, maintenance and lubrication. Hartzell Propeller Fan Co.

234 Tubing for Many Jobs—Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube R, two types of lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of fabric. Gives applications of both types. Flexible Tubing Corp.

DUST CONTROL

235 Dust Control Brochure—Dust and fume control in many industries is the subject of this comprehensive 24-pp booklet. Tells how cloth-tube type dust collectors are handling complex problems in 33 typical installations, all illustrated. Covers use of these collectors in chemical processing, coal cleaning, sewage disposal, many other applications. American Wheelabrator & Equipment Corp.

236 Dust Control Technology—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

237 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

238 Dust Recovery—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

239 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

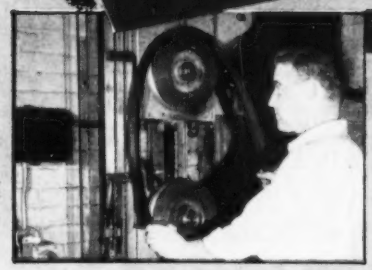
240 Valves and Fittings—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

241 For Quick Valve Selection—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

242 Valve Maintenance Guide—"Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation,

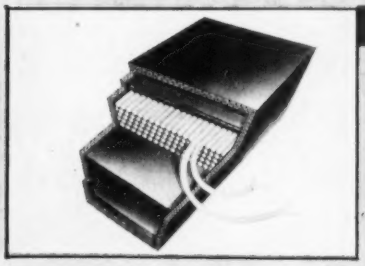
DURKEE ATWOOD V-BELTS

EXTRA VALUES
FOR USERS OF INDUSTRIAL V-BELTS



VERTICAL MATCHING ASSURES EQUAL POWER TRANSMISSION

Durkee-Atwood's new vertical V-belt matching machines eliminate the "sag" error always present when V-belts are matched on horizontal matching equipment. Calibration of true running length assures equal power transmission from all belts on multiple belt drives. The machines also test for vibration and possible internal imperfections.



DU PONT CORDURA® RAYON MULTIPLE CORD CONSTRUCTION

High-tenacity Cordura® rayon cords give Durkee-Atwood Industrial V-Belts longer life, less stretch, and greater shock resistance. Use of this revolutionary new cord material is another one of the reasons why D-A Industrial V-Belts are guaranteed to satisfy on any drive.

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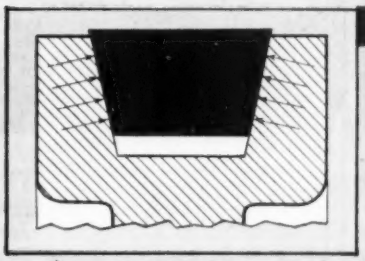
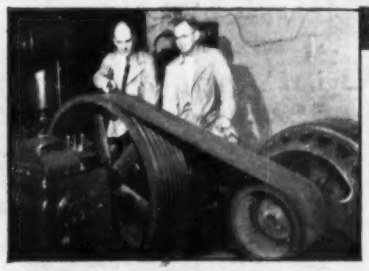


STRAIGHT SIDEWALLS—FULL GROOVE CONTACT

Durkee-Atwood V-Belts are manufactured with straight sidewalls to maintain full groove contact at all times giving positive drive action. Straight sidewalls reduce slippage and assure smooth, efficient power transmission. The load is distributed evenly over the entire thickness of the belt giving it longer life.



FIELD-TESTED AND APPROVED

Every set of Durkee-Atwood Multiple V-Belts is balanced isodynamically. By running matched sets under full load on special testing equipment, Durkee-Atwood engineers verify their exact equality of load distribution and tension. When you buy Durkee-Atwood Multiple V-Belts you can count on maximum power transmission efficiency. Write Dept. PE-8 for D-A 60-page engineering catalog containing new RMA-approved INCREASED HP ratings for Industrial V-belts.

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DURKEE ATWOOD V-BELTS

DA PRODUCTS SINCE 1910

Form No. 542

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New Way to Reduce Sling Costs 22.3%

Notice how Pin-Lock Thimbles are held securely in position by steel pins. These pins make it easy to transfer Pin-Lock Thimbles to replacement Red-Strand Slings.

Save by reusing Pin-Lock Thimbles on Red-Strand Braided Slings

Now . . . *stop* discarding still-good sling thimbles! With Red-Strand Braided Slings, you simply transfer *reusable* Pin-Lock Thimbles from one sling to another. *Cut costs substantially.*

Savings of 22.3% are typical. See chart at left for other examples.

Pin-Lock Thimbles also guard against unexpected damage to sling loops. They're made of extra heavy, extra durable cast steel.

You save still more because Red-Strand Slings are made of higher-than-rated quality Leschen wire rope—famous for longer-than-expected service.

Doesn't this suggest checking Red-Strand Slings *right now?*

See your LESCHEN representative or write for folder, "NEW IDEAS in Slings."

A. Leschen & Sons Rope Co.
St. Louis 12, Mo.

HERE'S HOW MUCH YOU SAVE WITH Red-Strand SLINGS AND Pin-Lock THIMBLES	
Sling Size	% Savings
9/16" x 10'	33.0%
1/2" x 10'	23.6%
1/2" x 20'	17.2%
3/8" x 8'	22.3%
1/4" x 5'	15.5%
3/16" x 8'	13.0%
3/32" x 10'	8.5%

LESCHEN

***Red-Strand* SLINGS & WIRE ROPE**
of Higher-Than-Rated Quality

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DATA FILE

(Begins on page 135)

inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

243 Automatic Valves—Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

244 Valves for Processing—General Catalog 1500 B, 20 pp, describes in detail the operation and performance of all of company's single seated valves—the Domotor, electo-pneumatic, handwheel and combination models. Optional assemblies for specialized applications are shown. Application information, operating characteristics given. The Annin Co.

245 Efficient Flow Control—Data on bronze, iron, steel and corrosion-resisting valves in a wide range of types, for oil, water, gas and low pressure steam. Shows how valves are designed for service, low maintenance. The Wm. Powell Co.

246 Bronze Valves—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

247 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

248 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

Postage-free Reader Service Cards make it easy to order any of this literature. See pages 35-36 and 133-134.

249 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

250 Welding Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section covering material specifications. Bonney Forge & Tool Works.

251 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

NEW

Periodically, new motor-driven washer completely cleans cell plates—re-applies adhesive—by "push-button" operation. Moving nozzles clean thoroughly to full cell depth.

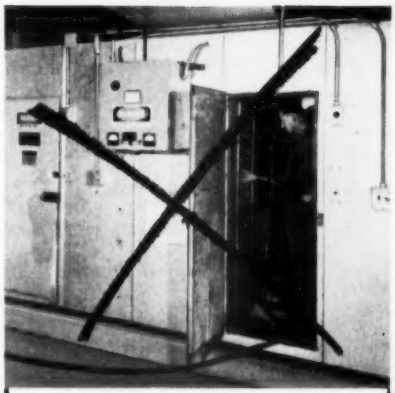
NOW—"PUSH-BUTTON" WASHING FOR ELECTRONIC AIR CLEANER

Now, a new, low-cost, automatic PRECIPITRON® washer cuts maintenance costs and eliminates unpleasant inside-the-duct washing of cells.

This unique device features moving nozzles, making PRECIPITRON the easiest electronic air cleaner to service. After thoroughly cleaning the plates, the washer reapplies adhesive. Entire operation is under "push-button" control. Laboratory and field tests have proved that moving-nozzle washing is a "must" for proper cleaning.

Type PX PRECIPITRON, the electronic air cleaner, traps microscopic airborne particles of dirt, dust, grime and pollen which would pass through conventional filters. It fits into any heating, ventilating or air conditioning ductwork.

Learn how PRECIPITRON will keep the air in your building dirt-free at negligible cost. Call your local Westinghouse-Sturtevant office, or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.



Maintenance men no longer need to enter enclosure to clean PRECIPITRON. New "push-button" feature does away with hot, wet tasks.

WESTINGHOUSE AIR HANDLING

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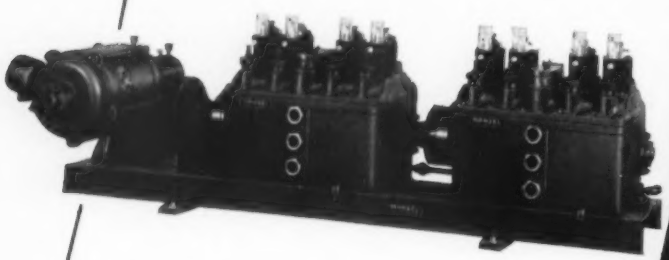
HOW TO CURE

"Fluid-Feedosis"*

A CASE HISTORY

PROBLEM: Chemical Companies needed really dependable equipment for high pressure lubrication of compressor cylinders and bearings.



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*Difficulties in pumping chemicals, oils, and other fluids in accurate quantities for lubrication, chemical treating, or other purposes.

For the solution to lubrication difficulties, or chemical feeding problems, more and more companies are turning to Manzel. For 50 years a leader in the field, Manzel is today a flexible, fast-moving organization with the special technical skill for meeting *your* needs quickly and economically. Write for further information about Manzel Force Feed Lubricators and Chemical Feeders.

Safeguard high priced machinery with MANZEL FORCE FEED LUBRICATION

- Reduce Wear
- Prevent Breakdown
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DATA FILE

(Begins on page 135)

252 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercial steel pipe. Tube Turns, Inc.

253 Handbook on Fittings, Flanges—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

254 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

255 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

256 To Stop Those Leaks—Catalog 41-0 offers 28 pp of helpful ordering and application data on pipe repair clamps and saddles, valve and bibb reseaters. Illustrates each product, tells where to use it and how to install it, giving dimensions and prices. M. B. Skinner Co.

257 Pipe Insulation—Form 76-102 is a small folder stressing efficiency and economy of Amocel, a lightweight asbestos pipe insulation for temperatures to 650 F. Discusses its low thermal conductivity, high mechanical strength in relation to its weight. Union Asbestos & Rubber Co.

INSTRUMENTS, CONTROLS

258 Wide Range Regulator—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

259 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

260 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

262 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level, bottles; transformer-relays, valves. The Mercoid Corp.

263 Industrial Controls—Catalog 8305, 84 pp, describes and illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity; also pneumatic and electric valves, switches and relays. Indexed and compiled for easy use, catalog provides specifications, dimension drawings, application data and ordering information. Industrial Div., Minneapolis-Honeywell Regulator Co.

For Maximum Branch Circuit Protection

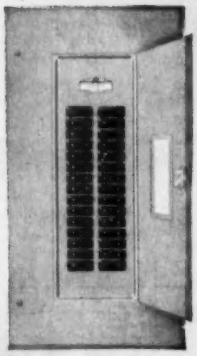
INSTALL NQP QUICKLAG P *Circuit Breaker* PANELBOARDS

THE LATEST Ⓕ contribution to more flexible and efficient branch circuit protection . . . panelboards that are not only safe, dependable, long-lasting and trouble-free but have the added advantage of providing adequately for today's electrical needs as well as future requirements.

Small and compact, these new and improved panelboards feature the new Ⓕ QP Quicklag P Circuit Breaker with thermal magnetic overload protection and manual or automatic quick-make and quick-break operation.

Ⓕ NQP Quicklag P panelboards are available in eleven sizes of enclosures — six with main lug connection and five for main circuit breaker connection, 50 — 225 amp capacity. These, plus a stock of individually packed single and double pole Ⓕ QP Quicklag P circuit breakers will fit any job requirement. Because all circuit breakers are interchangeable, it is easy as replacing a light bulb to make changes or add new units.

Install these panelboards on all your branch circuits. You'll find that they will virtually pay for themselves in efficiency and service. For additional information, contact your nearest Ⓕ representative, listed in Sweet's or your contractor or wholesaler.



Ⓕ NQP-L panelboard with main lugs.

Ⓕ QP Quicklag P Circuit Breaker.

Ⓕ NQP-AB panelboard with main circuit breaker.

CAPACITIES: 15, 20, 30, 40 and 50 amps; 120 volts, single pole or 120/208 volts, double pole, individual trip; 4 to 42 poles; 120/240 volts, 3 wire single phase or 120/208 volts; 4 wire three phase mains with lugs only or main circuit breaker.

Ⓕ NQP QUICKLAG P FEATURES

1) **Quick-make and quick-break operation manually or automatically on harmless overloads, short circuits or severe overloads. Handle position indicates "tripped."**
2) **Quick restoration of service simply by moving handle to "off" and then to "on" position.**
3) **Screwless assembly (*just slip breakers in*) with one pressure type connection between circuit breaker and bus bar.**
4) **"Sequence bussing" to balance the load and permit double pole, individual trip combinations.**
5) **Boxes only 14" wide with 4" gutters.**

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DATA FILE

(Begins on page 135)

ELECTRICAL

264 Motor-Generator Reference Book—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their applications and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control, general characteristics. Allis-Chalmers Mfg. Co.

266 Motor Handbook—Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

267 Motor Panorama—Motors and generators—about 50 types in all—are pictured in Publication AEB 100.8B, which serves as a handy reference, since it lists specific literature dealing with each motor shown. Gives general construction details of each unit. Fairbanks, Morse & Co.

269 The Answers on Wiring—"20 Questions and 20 Answers on Safety m.i. Wiring" describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes, weights and lengths, as well as a partial list of users included. General Cable Corp.

270 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

271 Plug-In Power—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

272 Power Distribution Feeders—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution systems, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

273 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

274 Power Distribution Practices—The 28-pp "Industrial Power Distribution Idea Book" (Bulletin GEA-5900) is a guide for plant engineers on electric power distribution practices in large and small plants. Covers utility distribution practices; methods of buying power; what to do when a choice of primary voltages is available; application of primary switches and circuit breakers; types and arrangements of primary cables; and types of load-center distribution systems. Also discusses branch feeder switches, starters, and fuses, grounding of systems, interrupting capacity. General Electric Co.

276 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also trap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

277 Battery Technology Handbook—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a section on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

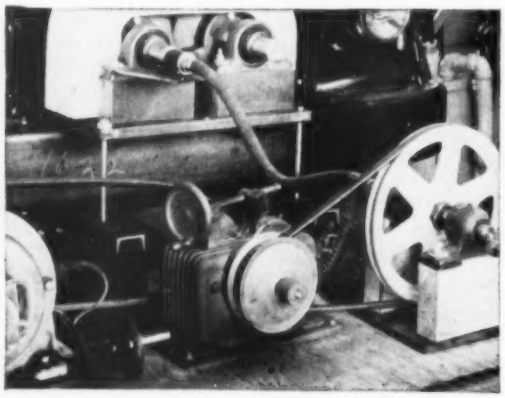
279 What You Should Know About Circuit Breakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

280 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. Lists applications for these starters and pictures enclosures. Square D Co.

282 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls is given. Westinghouse Electric Corp.

283 Snap Action Switches—Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

★ the right speed always to FIT THE JOB!



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Lovejoy Select-O-Speed Transmissions provide better, more efficient production control to help you improve the quality of your products.

Speed ratios to 10 to 1. Sizes to 5 hp. Hand lever or wheel control. Operate with standard V-Belt drives. Fully enclosed. Send now for illustrated catalog giving complete information.

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LO-HED HOISTS

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And beyond that, Lo-Hed has *extra* features that bring maximum safety and efficiency. Its bottom block, for example, is completely shrouded. On A.C. installations a transformer puts 110 volts instead of line voltage at the push button controls. Its hook is suspended on an oil-impregnated bearing that does away with tangled lines.

Available in five suspension types and in capacity ranges from 500 to 24,000 lbs., Lo-Hed gives you low headroom, too, for which you pay no premium. Mail the coupon below for complete information . . . it may lead to savings that count up, year after year.

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DATA FILE

(Begins on page 135)

284 Flexible Cords—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper co.d. Whitney Blake Co.

285 Electrical Equipment for Cranes—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.

286 Retractile Cords—This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos, explains how the cords are made, where used, advantages. Koiled Kords, Inc.

LIGHTING, COMMUNICATION

287 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp, contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

288 Precision Lamps—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

289 How to Use Sound Signals—This new 44-pp combination manual, data book and cata og is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a coding signal call system. Benjamin Electric Mfg. Co.

MECHANICAL POWER TRANSMISSION

290 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

291 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

292 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers a cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

293 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

294 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

295 Manual on Power Transmission Machinery—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering data, formulas. Dodge Mfg. Corp.

296 Shaft Collars—Steel shaft collars in 42 standard sizes for shafts from 3/16 to 3 in. dia are presented in this bulletin. Shows the collar in use on various types of machinery. Standard Pressed Steel Co.

298 Coupling or Converter—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters should be used, and why, furnishing a source of facts on non-technical terminology. Covers meaning and characteristics of torque and effect on driving and driven equipment. Twin Disc Clutch Co.

299 Roller Chains and Sprockets—Bulletin 52-1 is a 54-pp ordering book describing inherent advantages of roller chain and presenting all popular sizes of company's Baldwin-Rex roller chains. Gives excellent information on selection of standard drives, including engineering formulas and tables. Dimensions, strengths, weights and prices are included. Book also deals with sprockets, their characteristics and prices. Baldwin-Duckworth Div., Chain Belt Co.

MATERIALS HANDLING

300 Data on Tramrail Equipment—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

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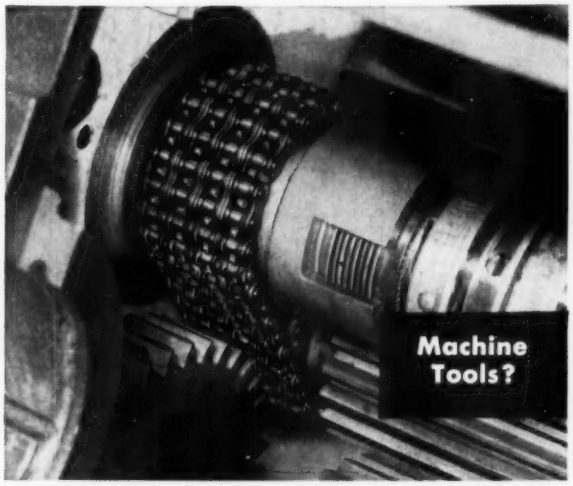
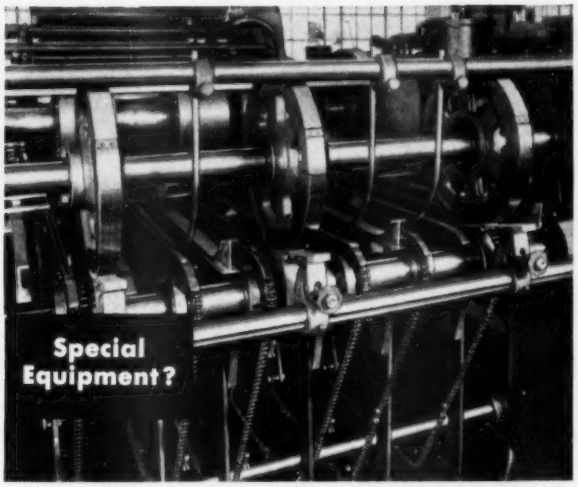


Diamond Roller Chain Drive (multiple strand) on high speed Rock Drill Rod Machine.



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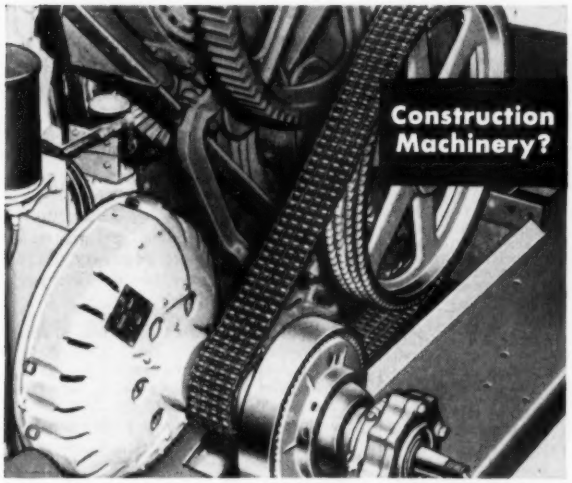

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ON BUILDINGS, bridges, viaducts—fir plywood concrete form panels cut application time and costs by up to 25%. They're light, strong, rigid. Easy to fabricate into cost-cutting built-up form sections. Re-use cuts costs, too. Contractors report 10-15 re-uses with Interior PlyForm, twice as many with Exterior PlyForm and new overlay panels. Plywood-formed concrete requires far less finishing. Big panels mean fewer joints, less leakage . . . smoother, better-looking concrete. For full details write Douglas Fir Plywood Association, Tacoma, 2, Washington.

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These trademarks identify quality-tested fir plywood manufactured especially for concrete form work. *Interior PlyForm* (highly moisture-resistant glue) gives multiple re-use. *Exterior PlyForm* (100% waterproof glue) gives maximum re-use.

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SPECIFY DFPA-INSPECTED PLYWOOD

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DATA FILE

(Begins on page 135)

301 Engineered Monorail Applications—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

302 For Overhead Handling—This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.

304 Materials Handling Equipment—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

305 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

306 Cost-Cutting Conveyor Units—Standardized gravity and power units covering a wide range of conveying jobs are described and pictured in Bulletin 63-C, 30 pp. Roller, wheel, and belt conveyors, elevating units, drives and accessories are presented, along with specifications. Practical in its approach, this book offers ideas for the use of these units. Standard Conveyor Co.

307 Tubular Conveyors—Form HC-541 contains about 44 pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

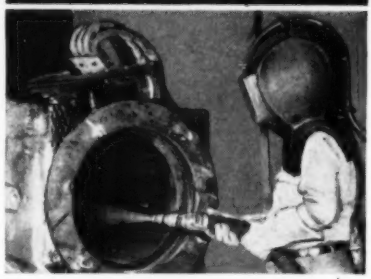
308 Conveyor Belting—Twelve types of conveyor belting, for standard heavy duty and special applications, are described in this bulletin. Pictures the beltings in use, and discusses in detail some of the impregnations and coatings utilized. Main Belting Co.

309 Safe Truck Operation—"Safety Saves!" is a 24-pp booklet setting forth "do's" and "don'ts" established as a practical code of truck operation. The admonitions, pointed up by cartoons, serve as both "refresher course" and text. Industrial Truck Div., Clark Equipment Co.

310 How to Pick a Truck—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

311 Industrial Truck Reference Guide—Bulletin 300, 44 pp, covers company's line of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded by an analysis of applications and merits of the handling system. Mercury Mfg. Co.

312 Industrial Logistics—Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to



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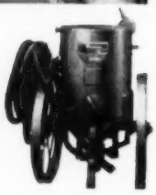

The Pangborn AC-4 Blast Machine cuts down-time to less than half by *eliminating waiting* for parts to dry . . . by *cleaning faster* . . . by *requiring no dismantling* in most cases. It uses soft 20-mesh corn cob grits to remove dirt, grease, old paint, etc. quickly and efficiently, without harming coils and other delicate parts. Look at these features:

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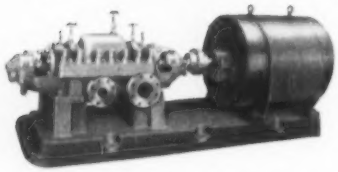
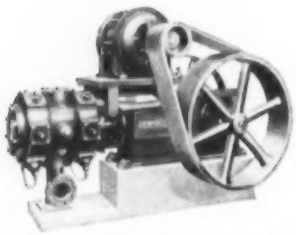
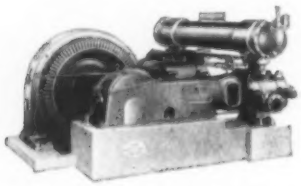


PENNSYLVANIA 2½-inch 6-Stage Class OHB THRUSTFRE Pump for Boiler Feeding. Bulletin 242-G



PENNSYLVANIA Horizontal, Single-Stage Heavy-Duty Compressor for General Use. Bulletin 201-G



PENNSYLVANIA Horizontal, Two-Stage Duplex Compressor for Larger Plants and for Soot Blowing. Bulletin 203-G

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DATA FILE

(Begins on page 135)

distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwe l-Parker Electric Co.

313 **Sheet Lifters**—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

314 **Industrial Elevators**—Bulletin 5211, 32 pp, industrial elevators and portable cranes. Shows portable elevators in hand- and electrically-operated types in load capacities from 500 to 5000 lb. Also presents pallet elevators, barrel elevators, platform loading and balcony elevators, four-post elevators for heavy duty use and stationary elevators. Barrett-Cravens Co.

315 **How to Operate a Crane**—Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the co-ordination of crane motions and includes safety rules and inspection, maintenance tips. Individual copies of this book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

316 **Locomotive Cranes**—Catalog 84, 16 pp, stresses advantages of the torque control unit used in company's cranes, and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

317 **Manual on Electric Hoists**—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

318 **Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

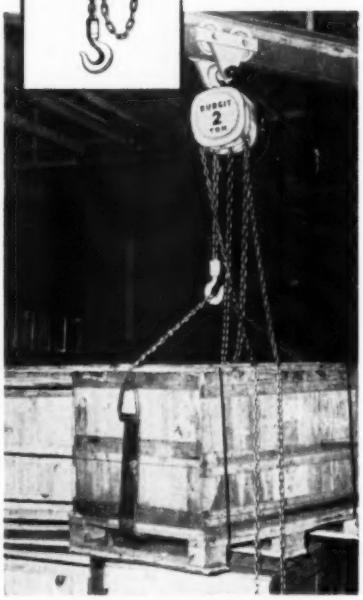
You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of the ad.

319 **Trolley Hoists**—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

320 **Trucks, Casters, Wheels**—Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

321 **Shovel and Loader**—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

MOVE INTO SPEED LIFTING



Every spot-lifting job is a job the 'Budgit' Aluminum Chain Block can handle faster and better. It's a knockabout hoist — a light, portable hoist anyone can carry, hang up by himself, and operate. The ¼-ton size weighs a mere 29 pounds. You can lift the full load with a 25-lb. pull on the hand chain. Other available capacities are: 1,000, 2,000, and 4,000 lbs.

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enable your chain blocks to travel the load as well as lift it. Made of tough steel. Adjustable to fit various I-Beam sizes. Ball bearing equipped. Capacities: 500 to 4,000 lbs. Priced from $15.50. Write for Bulletin No 390.

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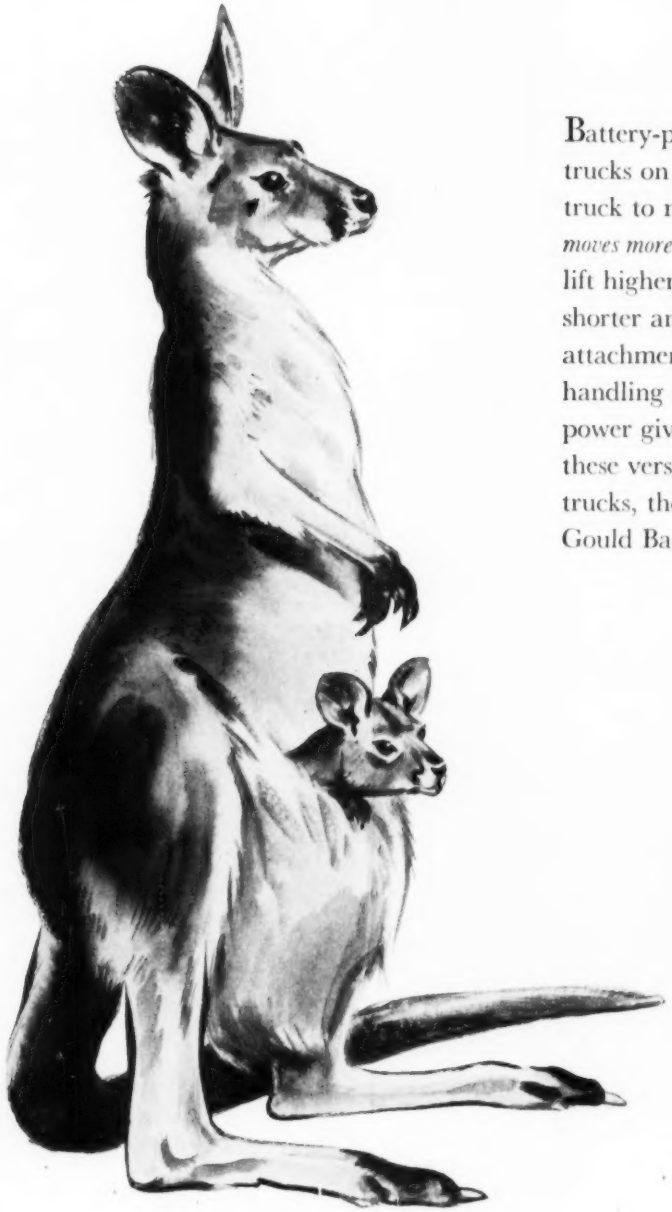
THANKS TO BATTERY POWER!



Battery-power keeps modern industrial trucks on the move . . . enables each truck to make *extra* trips per shift . . . *moves more tons at lower cost*. Today's trucks lift higher, maneuver faster, turn shorter and accept a wider range of attachments to meet today's materials handling requirements. Gould battery power gives you extra capacity for these versatile units. For industrial trucks, there's *no* power like Gould Battery power.

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DATA FILE

(Begins on page 135)

CONSTRUCTION

323 Glass Block Fenestration—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft and ventilation below window sill. Test data is summarized and recommendations included. Although test was conducted on glass block fenestration in school buildings, the information will be of interest to those concerned with industrial applications of glass block. Kimble Glass Co.

324 Heat Absorbing Glass—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating and maintenance costs. Mississippi Glass Co.

325 How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this plastic sheet. Plastic Dept., Rohm & Haas Co.

326 Technical Manual on Plywood—Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

327 How Hardboards Improve Methods—Twelve-pp Form 5202, on production economies in plant maintenance, materials handling and processing, enumerates applications and specifies types and thicknesses of company's Presdwood for specific purposes. Lists 28 advantages of Presdwood, describes its use in architectural applications, bins, utility boards, cabinetwork, containers, booths and ventilators, work surfaces. Masonite Corp.

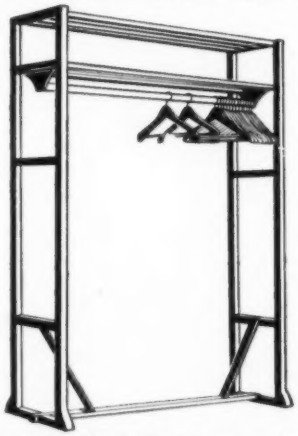
329 Metal Framing Guide—Although pocket-sized, 80-pp Catalog 800 is packed with illustrated information on an all-purpose metal framing system, and serves as a handy reference text. Fully indexed, shows the versatile basic channel, suggests possible combinations and pictures typical fittings and parts. Provides design and application data and pictures some of the almost unlimited uses for this framing system. Includes reference tables. Available to qualified plant engineers. Unistrut Products Co.

MAINTENANCE

330 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

332 Maintenance Manual—"Over the Rough Spots" is a 48-pp pocket size booklet giving the answer to practically every repair or building maintenance problem. Tells how to patch holes and resurface floors, how to prevent water seepage in underground foundations, repair leaky roofs, preserve concrete or wood surfaces, protect structural steel from rusting, and gives many time and labor saving methods. Generously illustrated. Stonhard Co.

Checkerette
Portable Steel Coat Rack



This "knock-down" wardrobe rack answers almost any "wraps" problem, because it can be set up anywhere in a few minutes without nuts, bolts or tools . . . can be disassembled and stored in small space when not in use. It is ideal for installation near point of work, occupies only 1' by 4' floorspace; is ideal for company cafeterias, offices, laboratories and meeting rooms.

It will hold wraps by day and shop coats at night and keep both aired and dry.

Modern, efficient designs, welded steel construction, rigid in use (all members held under tension).

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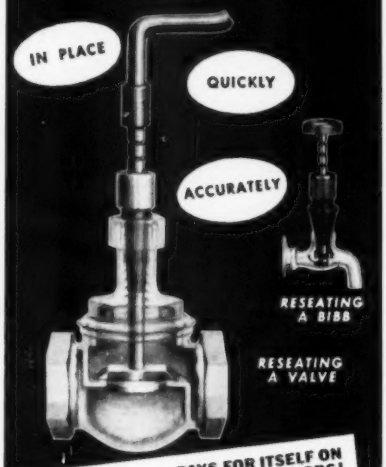

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TIME • MONEY
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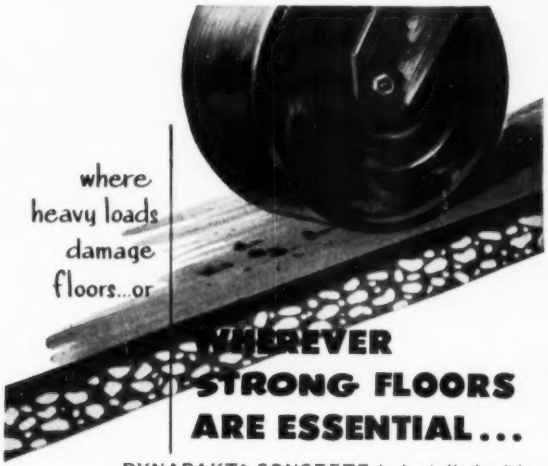

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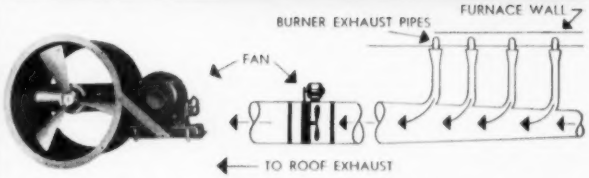
SOLUTION—A unique exhaust system using 9 Propellair Fans with total CFM of 70,607, requiring only 29 H.P.



■ Engineers for the McCormick Works of International Harvester in Chicago accomplished a neat trick in using a minimum of ductwork and only six 24" and three 30" ventilating fans in an exhaust system for 8 radiant tube furnaces.

Propellair Belt-Driven Fans (with motors outside airstream) were selected because of their record for exhausting explosive fumes with safety and efficiency. These fans have now been in continuous operation for 2 years—24 hours a day, 7 days a week. International Harvester says "results have been very satisfactory and maintenance at a minimum."

What's Your Ventilating Problem?

Propellair specializes in industrial fans designed for specific ventilating requirements. Propellair features include cast aluminum airfoil propellers, curved entrance rings, R&M *"All-Weather"* motors, certified air deliveries. Qualified sales engineers are available for consultation without obligation.

Write for Catalog 3082P

PROPELLAIR®
DIVISION OF ROBBINS & MYERS, INC.
SPRINGFIELD • OHIO

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For Efficient, More Economical Plant Operation

Fabri-Valves will save production time and money by reducing maintenance to a minimum. Custom fabricated to suit your specific operation, Fabri-Valves are precision engineered to assure uniform strength and exact thickness. They are fabricated of stainless steel, monel or any combination alloy plate rolled to complete weldment, giving complete internal and external protection wherever required.

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TRADE MARK

COMPANY OF AMERICA

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NORTHWEST COPPER WORKS, Inc.	Portland, Ore.
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MODERN TIME AND COST SAVERS BUILT BY... Standard GRAVITY & POWER CONVEYORS

LIFT OR LOWER— FLOOR TO FLOOR WITH A

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Move boxes, cases, cartons, sacks or bundles from basement to first floor, or any floor to floor — continuously with the Standard Inclinebelt. Compact — simple to install — minimum maintenance and attention. Lifts or lowers 10 to 20 lbs. of live load per ft.; floor elevations of 8 ft. to 14 ft. 6 inches inclusive; two belt widths to handle commodities 15½ inches to 25½ inches wide. Electric motor operated. Write for INCLINE-BELT Bulletin — address Dept. PE-83.

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General Offices: North St. Paul 9, Minn.

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Low Cost Protection for

HEAT EXCHANGER TUBE ENDS

In the past 31 years Conseco has provided millions of Flowrites for tube inlets of heat exchangers operating in all industries and all applications. Tube inlets become eroded and worn long before the remainder of the tube, and by reinforcing the inlets it is possible to increase the effective tube life many times.

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75 RIVER ST., HOBOKEN, N. J.

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DATA FILE

(Begins on page 135)

334 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corrosive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

335 Building Maintenance—Handbook 7 offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

336 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well-written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, cork, tile, linoleum, mastic wood. West Disinfecting Co.

338 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

340 For the Overhead Jobs — Scaffolds designed to make overhead work safer and easier are described in 16-pp Form 10-852. Illustrates and discusses adjustability, large working platform, easy assembly, self-locking trusses and other advantages. Shows how they are readily stacked for height. Baker-Roos, Inc.

341 Blower-Suction Cleaner—Data on a portable combination blower-suction cleaner for cleaning machinery, motors, stock bins is offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

343 Idea Book—Sixty pages of "1001 Shortcuts" for production, construction and maintenance make this hand-tool and hydraulic-tool handbook one of the most useful ever. Large photos and concise descriptions give ideas developed and successfully applied by hundreds of tool users. One of the big values attached to the "Idea Book" comes from the manner in which it stimulates the user to create his own ideas. Typical job photos suggest the general principles of the applications. Blackhawk Mfg. Co.

345 Pipe Tool Book—This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

346 Powerful Puller—Introduced in Bulletin 97-A is the compact Power-Twin, a fast-working hydraulic ram. Shows how this ram, with its center hole feature, can convert all of company's pulling systems to hydraulic push, pull or lift operation. Owatonna Tool Co.

347 Where to Use Your Stud Driver—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete,

is

coil-itis*

increasing your temperature problem?

Here is a new treatment for solving your heat transfer problems that is as revolutionary as a new wonder drug. It stops coil-itis* cold . . . It eliminates the many troubles that have plagued industrial heating and cooling practices due to the use of old-fashioned, outmoded pipe coils. This revolutionary new unit, called a Platecoil, heats or cools 50% faster and takes 50% less space in the tank. It simplifies maintenance and saves hours of downtime.

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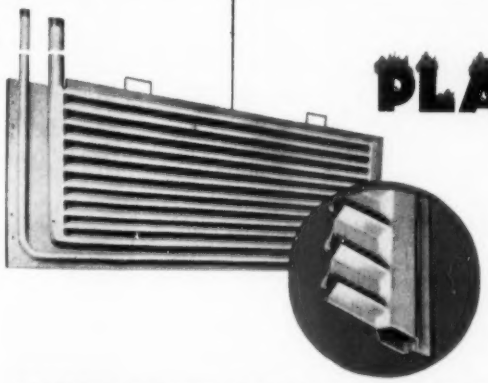
PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS COOL QUENCH OIL TANK FOR ⅓ THE COST

At the K-D Manufacturing Company, Platecoils are proving more efficient, yet cost only 1/3 as much to install. Ask about other case histories.



PLATECOIL

REPLACES PIPE COILS

*Coil-itis — Diagnosed as tank heating and cooling problems. Platecoils — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, TRANTER MANUFACTURING, inc., Lansing 4, Michigan

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CUT MAINTENANCE COSTS with BAKER SCAFFOLDS

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- ADJUSTABLE
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WITH THE CENTER-HOLE OTC 50 TON HYDRAULIC PULLER

New 50 Ton CENTER-HOLE Hydraulic Puller

Removes or installs bearings, gears, pinions, shafts, studs, wheels, pulleys, etc. — 75% faster and 90% easier without damage or distortion. This new OTC 50 ton ram is completely portable (weighs only 45 lbs.) — has remote control pump — interchangeable ram heads — and can be used as a production holding fixture. Also available in 17½ and 30 ton sizes.

WRITE FOR FREE BOOKLET

Booklet describes complete line and uses of OTC tools.

OWATONNA TOOL COMPANY
446 CEDAR STREET • OWATONNA, MINN.

For more facts circle 612 on Reply Card

DATA FILE

(Begins on page 135)

wood into steel and steel into steel, as well as their use for attachment of predrilled fixtures. Remington Arms Co., Inc.

348 For Faster Fastening—Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

350 Pipe Tool Ordering Guide—Catalog 2-51, 8-pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

351 Metal Spraying Gun—Company's Type 4E gun for high-speed spraying with all metals is described in Bulletin 94. A cutaway drawing shows construction features of the gun which is designed for tool-post mounting or hand operation. Metallizing Engineering Co., Inc.

352 Socket Wrenches—Sixteen-pp Catalog 460 presents a line of socket wrenches in sizes from ¼ to ¾ in. square drive, also socket wrench sets, heavy duty sockets and open end wrenches. Illustrated, gives sizes, weights and packaging information. Fairmount Tool & Forging, Inc.

LUBRICANTS, LUBRICATION

353 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equiment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

354 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrotion. Socony-Vacuum Oil Co.

355 Versatile Industrial Oil—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equiment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

356 High Temp Lubrication—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

357 Force Feed Lubricators—This catalog describes and illustrates force feed lubricators for positive and automatic lubrication of cylinders and bearings. Stresses accessibility of enclosed working parts, other design features. Manzel.

OTHER EQUIPMENT

358 Braided Rod Packing—This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustrations of types available, tables of service recommendations, specifications. The Garlock Packing Co.

359 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms which are included in this service. Scott Paper Co.

360 For Conductometric Determination of Solids—A quick and simple method for determining solids contents of boiler water or condensate is explained and illustrated in Bulletin TRE50. Hall Laboratories, Inc.

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A 4-ply, 60-feet endless belt, 96 inches in width, is being stitched on one of the largest sewing machines in the world at the Main plant.

Whether you need a conveyor belt that is only one inch wide or several feet in width, you can depend on the RIGHT belt for the job when you specify Main belting.

Only Main makes conveyor belts *in any width up to 132 inches*—quality belts that give long, economical service.

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- EASY TO MOVE

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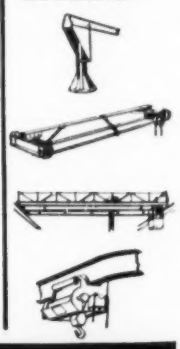
The Abell-Howe line includes a wide range of motorized and hand operated cranes, runways, monorails, electric hoists, storage racks and accessories.



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Bulletin F-114
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More Light with Same Power Load

Plus

INDOOR OUTDOOR
High or Low Bay Installation

No Dirt-catching Reflectors

200 to 1000 Watts
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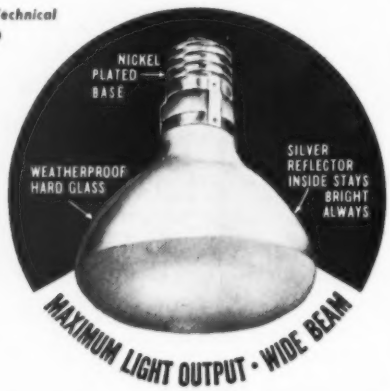
HARD GLASS
Won't crack due to sudden temperature changes, moisture, and flying insects.

LOW MAINTENANCE
No reflectors to clean. Higher light output maintained throughout life of lamp with sealed-in silver reflector.

LOW COST INSTALLATION
Only simple socket required for high or low bays. Uses light-weight, low-cost weatherproof outdoor lamp holders.

Send for Technical Bulletin 80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for the summer

. . . but when winter comes dry air will return to cause trouble in your plant. Will you be ready for it with adequate humidification?

Now is the time for decision. Next winter will be too late to conveniently install dependable, low cost, automatic Armstrong steam humidifiers. They are guaranteed to satisfy. You can't lose by taking a look—

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ARMSTRONG STEAM HUMIDIFIERS

For more facts circle 617 on Reply Card

DATA FILE

(Begins on page 135)

361 **Hydro-Pneumatic Accumulators**—Bulletin 301, 12 pp, explains the function, construction and operation of company's hydro-pneumatic accumulators, giving size and pressure data. Tells how to choose an accumulator with Boyle's law. Use of accumulators as an auxiliary source of power for intermittent duty systems, for leakage compensation, for operating secondary circuits, as an emergency source of power and other applications are discussed and illustrated. Greer Hydraulics Inc.

362 **Production Control System, Procedures**—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production line. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

363 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

364 **Good Place for Wraps**—Manufacturer's Lockerettes, modern scientific locker units combining best features of both lockers and coat racks are described and pictured in Bulletin 658. Vogel-Peterson Co.

365 **Finishing Systems**—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamels, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors and fog filters, metal cleaning and pickling equipment. The R. C. Mahon Co.

366 **Industrial Leathers**—These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also give data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

See pages 35-36 and 133-134 for postage-free mailing cards. Use them to ask for bulletins — just circle item numbers of all those wanted.

367 **Magnets in Stock**—A complete listing of stocked sizes and shapes of Carboloy Alnico permanent magnets is provided in 20-pp Bulletin PM-100. Contains pull curve and size information in tabular form on both cast and sintered types, as well as sizes and application data on holding assemblies, including sheet steel separators, magnetic retrievers and stands. A list of available patterns for various sizes of cast Alnico bars, etc. is included. Carboloy Dept., General Electric Co.

368 **Hints on Babbitting Practice**—In outlining basic steps for the prevention of common bearing failures, Bulletin 146, a little 16-pp booklet, covers everything from the choice of metal for a particular bearing application through the correct pouring practice to in-service maintenance. Proper lubrication, a maintenance schedule, and operation at correct speed are discussed. Federated Metals Div., American Smelting and Refining Co.

369 **Engineered Vibration Control**—Bulletin 104 presents spring, cork and rubber mountings, discussing advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended

Better Valves–Year After Year

Fig. 375—200-pound Bronze Gate Valve with renewable, wear-resisting "Powellium" nickel-bronze disc.

Because throughout more than a hundred years Powell Engineers have never been willing to "let well enough alone," the Powell Line of Valves has been continually improved and augmented to satisfy every new demand of industry.

That is why there is a greater variety of Powell Valves in service today than of any other make.

The Wm. Powell Company
Cincinnati 22, Ohio

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IRON, STEEL AND
CORROSION-RESISTING VALVES

DEPENDABLE VALVES SINCE 1846

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Do you need strong belting, too?

This remarkable Imperial Belt was installed in Chicago's Union Station as a mail bag conveyor in the summer of 1945. For more than seven years it has operated almost continuously—24 hours a day, seven days a week. The only exception is when power shutoffs or blockades occur. Such rare stoppages last only a few minutes. The belt that has turned in this tremendous service record is an Imperial Black Rexall, 36" x 4-ply, 410 feet long. It is one of more than 20 Imperial Black Rexall conveyors in the Chicago Union Station—belts whose aggregate length is 6740 feet, or well over a mile.

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Imperial Black Rexall is chosen for jobs like these because of its great strength and toughness. Constructed of tight-woven heavy-duty silver duck, it is double-stitched and inner-locked to prevent ply separation and is impregnated with a special compound that strengthens, lubricates and preserves the fibers. Black Rexall Belting is unexcelled for conveyors and elevators handling heavy or semi-abrasive materials.

Whatever your belting need, there is a job-designed Imperial Belt to fill your requirements and cut your handling costs. Write for Data Sheet 48-4A and prices.

Imperial BELTING CO.
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Engineered Belting—
The Right Belt for Each Job.

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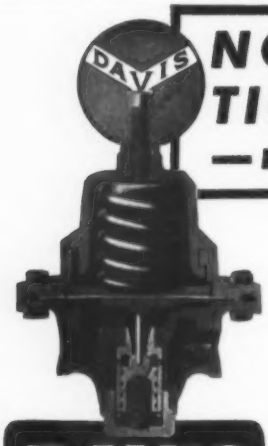

NON-STICKING! TIGHT CLOSING! —no pressure build-up

EXCLUSIVE DESIGN—
Single seated, tight closing, non-sticking, large diaphragm, sensitive pressure adjustment. Compact, rugged, self-contained.

TROUBLE-FREE SERVICE—
Built-in strainer, finest quality, all internal parts readily accessible and renewable without disturbing piping. Long economical service with minimum time out for repairs or replacement.

FOR STEAM, AIR OR GAS—
For initial pressures to 250 p.s.i.; reduced pressures, 1 to 100 p.s.i. Sizes from 3/8" to 2". Semi-steel bodies, bronze or stainless trim. Economical for use on small units.

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DAVIS REGULATOR CO.
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DATA FILE

(Begins on page 135)

and alternate methods of isolation. The Korfund Co.

370 Standardized Spray Booths—Literature is availab e on water wash, dry type, bench or leg type spray booths, based on standard panel sizes. Stresses easy erection, lower costs. The DeVilbiss Co.

371 Steam Condensers—Bulletin 102, 24 pp, is a comprehensive presentation of manufacturer's steam condensers and includes photos of six typical installations as well as a section of engineering data, a discussion of air removal equipment and condenser maintenance. Condenser Service & Engineering Co., Inc.

372 Plumbing, Heating Supplies—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, gives sizes, intended uses and necessary ordering information. J. A. Sexauer Mfg. Co., Inc.

373 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

374 Wire Rope, How to Use It—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. A'so presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

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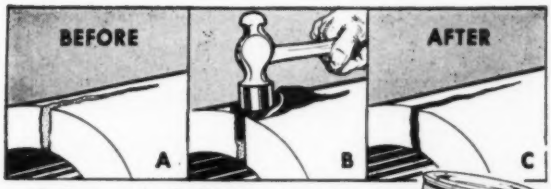

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THE IRON REPAIR CEMENT OF MANY USES

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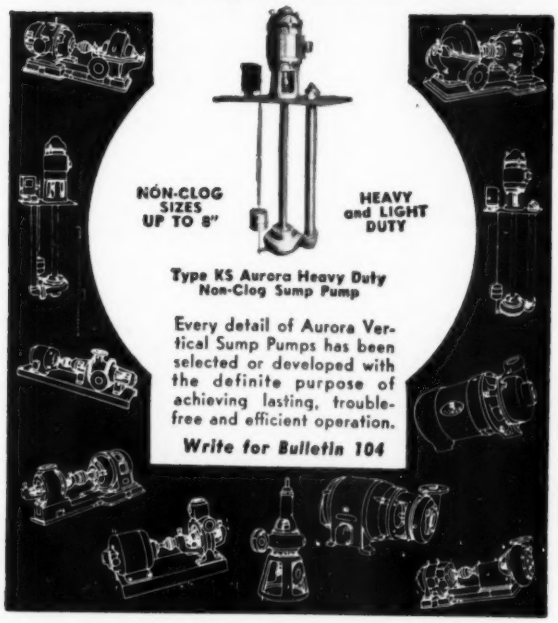
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Every detail of Aurora Vertical Sump Pumps has been selected or developed with the definite purpose of achieving lasting, trouble-free and efficient operation.
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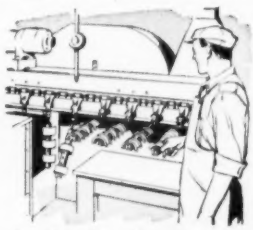
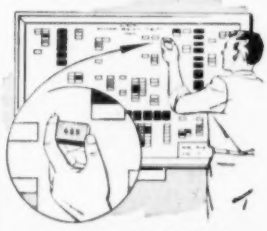
Shown below are a few of the ways magnets are used as mechanical holding devices – working better, cheaper, faster than devices previously used.



In plating-rack conveyors, for example . . .



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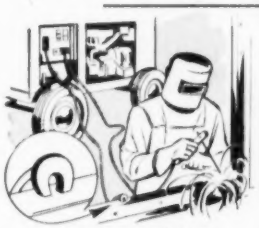

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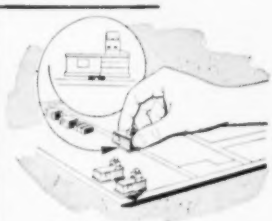

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NEW BOOKS

for the plant engineer

On Labor Relations

SUCCESSFUL LABOR RELATIONS FOR SMALL BUSINESS by James Menzies Black and J. George Piccoli. Size 9 by 6 in.; 425 pp; cloth bound. Published by McGraw-Hill Company. 330 West 42nd St., New York 36, N. Y. Price $6.00.

PEOPLE IN PLANTS with 1,000 employees or less quite often have to pattern their policies on the basis of what the large companies are doing. Such a procedure may not be the best or a very practical one for the small plant.

This handy guide is aimed to help persons in small businesses who are looking for information that applies more closely to their problems.

The experience of 600 manufacturers are reflected in this publication. It presents an extensive case history and analysis of an actual contract negotiation between a union and a company, covering a number of provisions. This includes the demands set forth by the union agent and the statements by a company representative regarding these.

A portion of the book is devoted to a discussion on arbitration; another is given to union organization in a company's plant.

Enough information is offered by the book to show how existing contracts can be improved, as well as existing labor relations.

Some of the topics that are covered by this book are as follows: personnel administration; collective bargaining; the hidden payroll; you and the National Labor Relations Board; so they've struck your plant; and the labor-management contract.

Engineering

ENGINEERING—A CREATIVE PROFESSION. Size 8 x 6½ in.; 30 pp; illustrated; paper bound. Published by Engineers' Council for Professional Development, 29 West 39th St., New York 18, N. Y. Price 25 cents.

VARIOUS BRANCHES of the engineering profession are briefly discussed in this booklet to give a prospective student an idea which one he should follow. Through a series of questions and answers between student and engineer, the reader learns about the common pattern of engineering work, the education and progress of an engineer.

The booklet tells what the engineer must know in order to work in his profession. It covers the engineer's association with other people who supply him with information or who aid him in his work.

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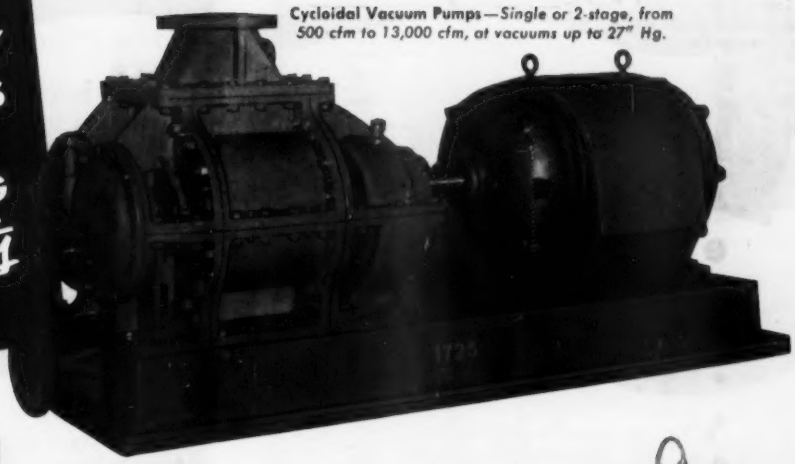

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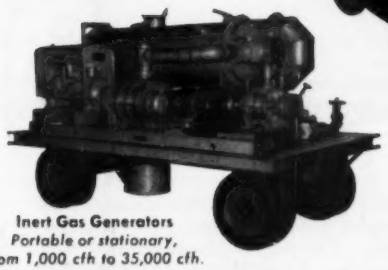

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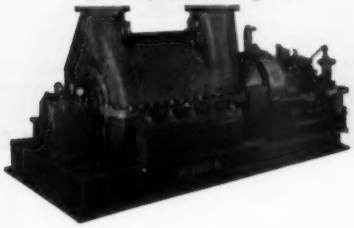

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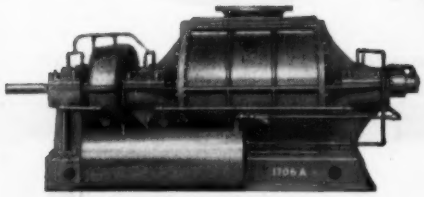

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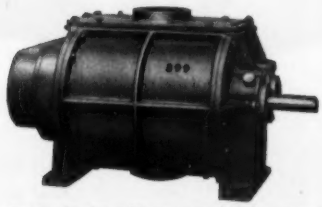

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Portion of the publication is devoted to the selection of a college for engineering study. It mentions the industrial fields of activity where engineers are utilized.

Pipefitting Guide

PIPEFITTERS HANDBOOK by Forrest R. Lindsey. Size 4 by 6½ in.; 282 pp; illustrated; cloth bound, flexible cover. Published by the Industrial Press, 148 Lafayette St., New York 13, N. Y. Price $6.00.

ESSENTIALLY the working notebook of the author, this book presents material collected and used during his 35 years of practical experience as a pipefitter.

Worked-out tables for pipe bends, offsets, mitered joints, pipe and fitting dimensions are important parts of this book. Other data included in the text will help the fitter in daily problems, figuring dimensions on bends, offsets, or joints in hangers. Complete tables provide quick answers for many of these problems; the fitter has but to enter the tables with his known dimensions to find readily the dimensions he would ordinarily have to calculate.

A brief rundown of the chapter headings illustrates the wide coverage of the tabular material: Pipe bending, screwed offsets, mitered joints, pipe and tube dimensions, welding fittings, soldering and brazing, spacing of pipe supports. Laying-in dimensions of all types of fittings and valves are given in tables, and a pipefitter's dictionary completes the volume.

Volume of Facts on Plant Maintenance Conference

TECHNIQUES OF PLANT MAINTENANCE, 1953. Size 8½ by 11¼ in.; 288 pp; cloth binding. Published by Clapp and Poliak, Inc., 341 Madison Ave., New York. Price $6.00.

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By handling innumerable bulk materials with Hapman Tubular Conveyors, you can slash these costs — and increase safety and efficiency! Can you handle metal chips from machine tools? *Yes!* Flour? *Yes!* Abrasive or corrosive chemicals? *Yes!*

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ence in Cleveland this year will be interested in reviewing the questions and discussions that took place there.

The 21 roundtables and sessions produced a volume of questions and answers, some of which appear in this book. Also included are texts of the 20 papers which were presented at the conference.

One of the new features is a cross-section of opinion on how various aspects of maintenance should be handled. Conferees were asked by various chairmen to indicate by a show of hands how their own plants solve particular problems. The results of the voting are published in this review.

Sectional conferences covered such subjects as: Works Engineering Organization, Preventive Maintenance, Maintenance of Buildings, Equipment and Power Plants, Corrosion Prevention and Control, and Maintenance in Small, Medium-Sized and Large Plants.

Roundtable sessions discussed Area vs. Centralized Maintenance, Lubrication, Pumps and Piping, Maintenance Stores, Foundries, and Maintenance in plants.

Standards on Copper and Copper Alloys

ASTM STANDARDS ON COPPER AND COPPER ALLOYS. Size 6 by 9 in; 540 pp; illustrated; paper cover. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pennsylvania. Price $5.00.

ALL OF THE ASTM standards pertaining to copper and copper alloys which were developed by the Copper Committee and other technical committees have been brought together in this up-to-date book.

This 1953 edition includes 115 widely used standards, including 102 specifications, nine test methods; two recommended practices—one for tension test specimens for copper-base alloys for sand castings, the other for designating significant places in specified limiting values, and two classifications—one for cast copper-base alloys, the other of copper.

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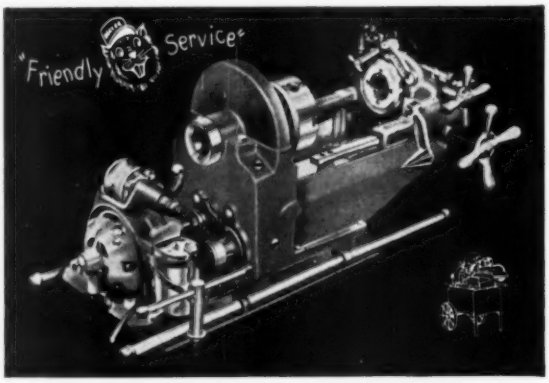

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such as slab zinc, pig lead, nickel, phosphor, silicon, electrolytic cathode copper, and others. Also included are test methods covering expansion, mercurous nitrate, resistivity, preparation of micrographs, tension, hardness, sampling, and grain size evaluation.

Incentives and Profits

MANAGEMENT REPORTS, published by Research Division, California Personnel Management Association, 2180 Milvia Street, Berkeley 4, California. Price $1.00 per report.

LINCOLN INCENTIVE MANAGEMENT, Report No. 142, 16 pp. This report covers a stenographic brief given by James F. Lincoln, President, Lincoln Electric Co., in which he discusses incentive programs and the important facts to consider when instituting a program.

PEOPLE AND PROFITS, Report No. 160, 10 pp. This report covers a stenographic brief by John A. Hill, President, Air Reduction Co., discussing how people and profits can work hand-in-hand in today's industrial world.

Power Transmission

MECHANICAL POWER TRANSMISSION Manual by William A. Williams. Size 8⅜ by 5⅝ in.; 423 pp including index; illustrated; cloth bound. Published by Conover-Mast Publications, Inc., 205 East 42nd St., New York 17, N. Y. Price $6.00.

BEGINNING with the history of the development of power transmission which includes European and Eastern contributions, this comprehensive work discusses modern practice and large variety of equipment.

The text material is presented in a readily understandable manner. Discussions cover the subject generally; some theory appears in the book but this is rather limited. The book offers information on such items as belt drives, chain and gear drives, driving equipment, bearings, drive selections and clutches.

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GRINNELL, COMPANY, INC. 7
Agency—Horton-Noyes Company

HALL LABORATORIES, INC. 121
Agency—Ketchum, MacLeod & Grove, Inc.

HAPMAN CONVEYORS, INC. 165
Agency—Paxson Advertising, Inc.

HARNISCHFEGER CORP. 46
Agency—Hoffman & York, Inc.

HEINEMANN ELECTRIC COMPANY 122
Agency—Thomas R. Sundheim

IMPERIAL BELTING COMPANY 160
Agency—Greenhaw & Rush, Inc.

JEFFERSON ELECTRIC COMPANY 52
Agency—Kirkgasser-Drew

JOHNS-MANVILLE, INC. 39
Agency—J. Walter Thompson Co.

JOY MFG. COMPANY 60
Agency—Walker & Downing

KIMBLE GLASS COMPANY 33
Agency—J. Walter Thompson Co.

KOILED KORDS, INC. 112
Agency—Hugh H. Graham & Associates, Inc.

KORFUND COMPANY, INC., THE 114
Agency—Sanger-Funnell, Inc.

LESCHEN & SONS ROPE CO., A. 140
Agency—Arthur R. MacDonald, Inc.

LIQUIDOMETER CORP., THE 165
Agency—Lucerna Company, Inc.

LOVEJOY FLEXIBLE COUPLING CO. 144
Agency—Symonds, MacKenzie & Co., Inc.

LUBRIPLATE DIVISION, FISKE BROS. REFINING COMPANY 22
Agency—E. M. Freystadt Associates, Inc.

MAHON COMPANY, THE R. C. 57
Agency—Anderson, Inc.

MAIN BELTING COMPANY 157
Agency—Renner Advertisers

MANNING, MAXWELL & MOORE, INC. 150
Agency—Fuller & Smith & Ross, Inc.

MANZEL 142
Agency—Baldwin, Bowers & Strachan, Inc.

MASONITE CORPORATION 55
Agency—The Buchen Company

METCO SYSTEMS 169
Agency—The Schuyler Hopper Co.

MICRO SWITCH 44
Agency—Reincke, Meyer & Finn, Inc.

MINNEAPOLIS-HONEYWELL REGULATOR CO. 66
Agency—The Aitkin-Kynett Co.

MISSISSIPPI GLASS COMPANY 26
Agency—Ralph W. Smith Adv. Agency

NIAGARA BLOWER COMPANY 116
Agency—The Moss-Chase Co.

NORTHERN BLOWER COMPANY, THE 58
Agency—Carr Liggett Adv., Inc.

OHIO INJECTOR CO., THE Inside Front Cover
Agency—Fuller & Smith & Ross, Inc.

ORR & SEMBOWER, INC. 27
Agency—Beaumont, Heller & Sperling, Inc.

ORTON CRANE & SHOVEL CO. 56
Agency—W. S. Kirkland Advertising

OWATONNA TOOL CO. 156
Agency—E. T. Holmgren, Inc.

PANGBORN CORPORATION 6, 148
Agency—Van Sant, Dugdale & Co., Inc.

PATTERSON-KELLEY COMPANY, INC. 102
Agency—O. S. Tyson & Company, Inc.

PENNSYLVANIA PUMP & COMPRESSOR CO. 150

PITTSBURGH COKE & CHEMICAL CO. 68
Agency—Walker & Downing

POWELL CO., THE WM. 159
Agency—Associated Advertising Agency, Inc.

POWERS REGULATOR CO., THE 164
Agency—Symonds, MacKenzie & Company, Inc.

RADIANT LAMP CORP. 158
Agency—Joseph S. Vogel & Co.

RAMSET FASTENERS, INC. 152
Agency—Fuller & Smith & Ross, Inc.

REMINGTON ARMS CO., INC. 104
Agency—Batten, Barton, Durstine & Osborn, Inc.

REMINGTON RAND COMPANY 43
Agency—Leeford Adv. Agency, Inc.

RHOADS & SONS, J. E. 42
Agency—R. E. Lovekin Corporation

ROBBINS & MEYERS, INC. 153
Agency—Greenhaw & Rush, Inc.

ROBBINS & MEYERS, INC. 38
Agency—Odiorne Industrial Advertising

ROCKWELL MFG. COMPANY 136
Agency—Marsteller, Gebhardt & Reed, Inc.

ROHM & HAAS CO. 37
Agency—John Falkner Arndt & Co., Inc.

ROOTS-CONNERSVILLE BLOWER 163
Agency—Fuller & Smith & Ross, Inc.

SARCO COMPANY, INC. 164
Agency—Rickard & Company, Inc.

SCOTT PAPER COMPANY 115
Agency—J. Walter Thompson

SEXAUER MFG. CO., INC., J. A. 24
Agency—Friend, Reiss, McGlone

SHEPARD NILES CRANE & HOIST CORP. 110
Agency—Taylor M. Ward, Inc.

SKINNER COMPANY, M. B. 152
Agency—Jones & Taylor & Associates

SLY MFG. CO., THE W. W. 124
Agency—The Bayless-Kerr Company

SMOOTH-ON MFG. CO. 161
Agency—Michel-Cather, Inc.

SOCONY-VACUUM OIL CO., INC. 117
Agency—Compton Advertising, Inc.

SPRING PACKING CORPORATION 130
Agency—William Hart Adler, Inc.

SQUARE D COMPANY 132
Agency—Reincke, Meyer & Finn, Inc.

STANDARD CONVEYOR COMPANY 154
Agency—Klau-Van Pietersom-Dunlap Associates

STANDARD OIL CO. (INDIANA) 53
Agency—McCann-Erickson, Inc.

STANDARD PRESSED STEEL CO. 16
Agency—Gray & Rogers

STONHARD COMPANY 169

THOMAS TRUCK & CASTER CO. 167
Agency—The Biddle Company

THOMPSON ELECTRIC COMPANY, THE 54
Agency—Penn & Hamaker

TIDE WATER ASSOCIATED OIL CO. 34
Agency—G. M. Basford Company

TRANE COMPANY, THE 20
Agency—Campbell-Mithun, Inc.

TRANTER MANUFACTURING, INC. 155
Agency—The Jaqua Company

TRUMBULL ELECTRIC
DEPT. OF GENERAL ELECTRIC 67
Agency—Wilson, Haight & Welch, Inc.

UNION ASBESTOS & RUBBER COMPANY 99
Agency—William Hart Adler, Inc.

VOGEL-PETERSON COMPANY 152
Agency—Ross Llewellyn, Inc.

WAGNER ELECTRIC CORPORATION 31
Agency—Arthur R. Mogge, Incorporated

WALWORTH 123
Agency—G. M. Basford Company

WESTINGHOUSE ELECTRIC CORPORATION
8-9, 18-19, 28-29, 166, 167
Agency—Fuller & Smith & Ross, Inc.

WESTINGHOUSE ELECTRIC CORPORATION
STURTEVANT DIVISION 141
Agency—Fuller & Smith & Ross, Inc.

WING MFG. CO., L. J. 126
Agency—Willard G. Myers Adv. Agency

YALE & TOWNE MFG. COMPANY, THE 17
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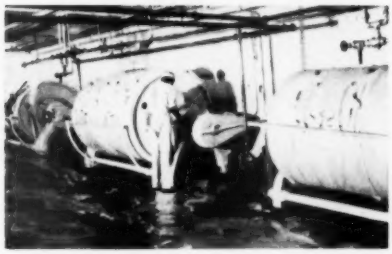

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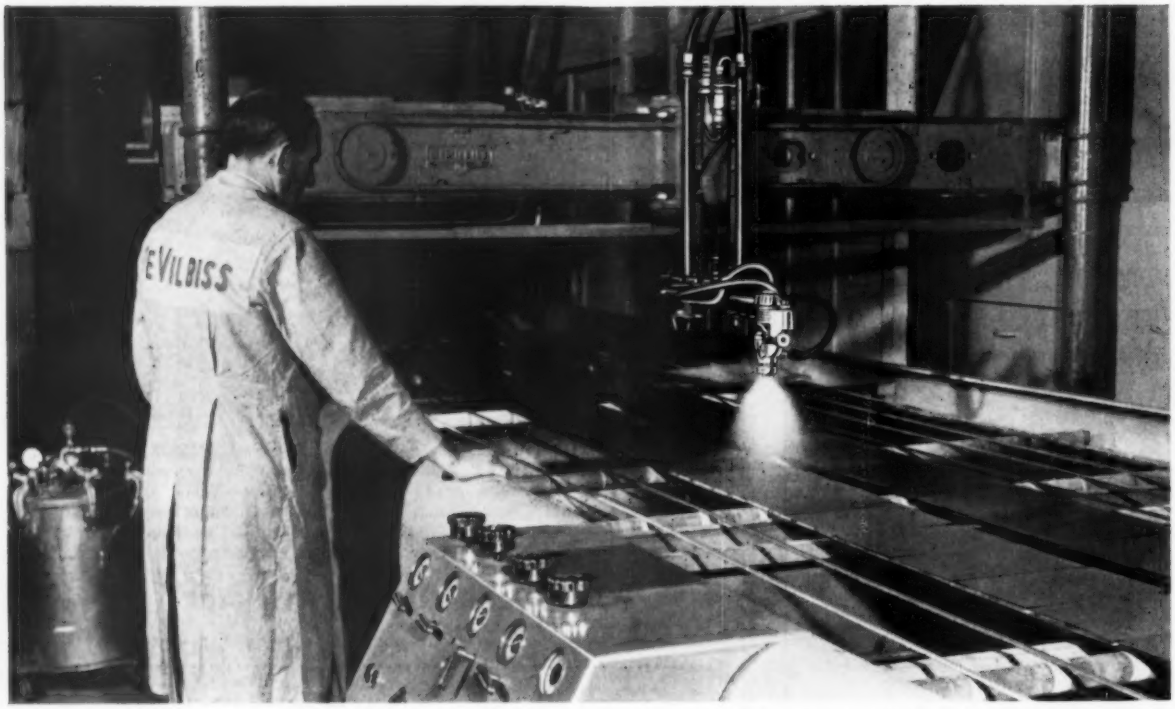

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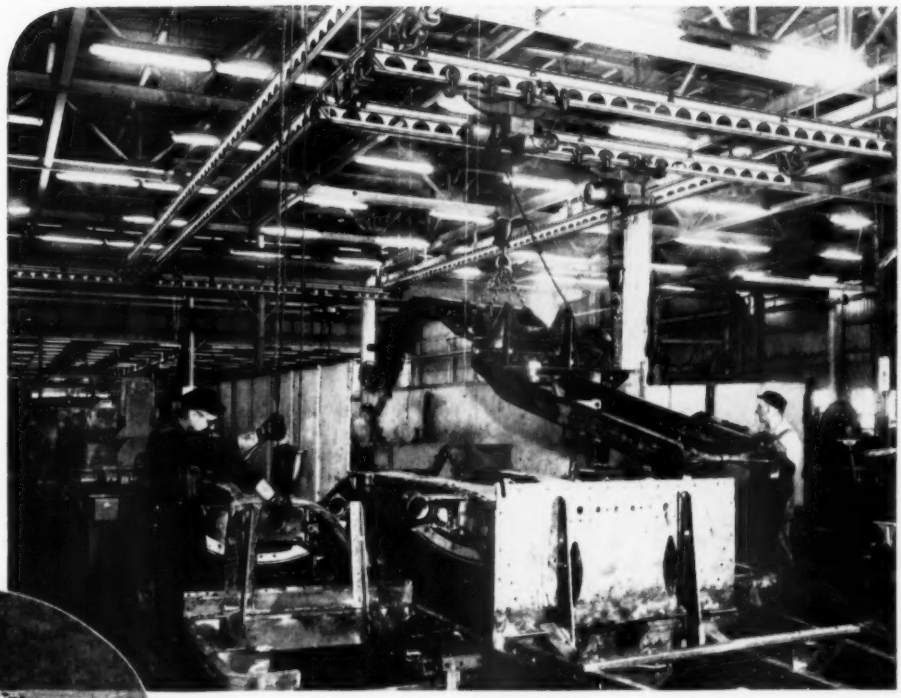

A hand-propelled interlocking crane system with two-ton electric hoists makes the handling of heavy parts easy in the Motor Grader Frame Assembly Section, Peoria, Illinois, Plant.

Caterpillar Diesel No. 12 Motor Grader in action.

EXTENSIVE TRAMRAIL INSTALLATIONS SERVE TWO GIANT CATERPILLAR TRACTOR CO. PLANTS

Peoria Plant Alone Has $1,000,000 Installation

SINCE the first small initial order for Cleveland Tramrail was placed by Caterpillar Tractor Co. over a quarter of a century ago, their installation has grown steadily until now in the vast Peoria Plant alone there is considerably more than one million dollars' worth in operation.

A large part of the job in building tractors, motor graders, diesel engines, etc., is handling materials. It is calculated that 20 tons of handling is required for each ton of tractors or diesel engines shipped from the plant. Saving a few minutes on each ton handled, amounts to a tremendous overall figure and resultant dollar savings.

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OVERHEAD MATERIALS HANDLING EQUIPMENT

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☆ installs easier
☆ works better
☆ lasts longer

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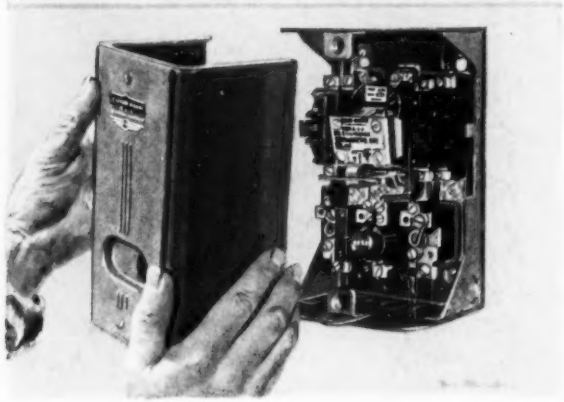
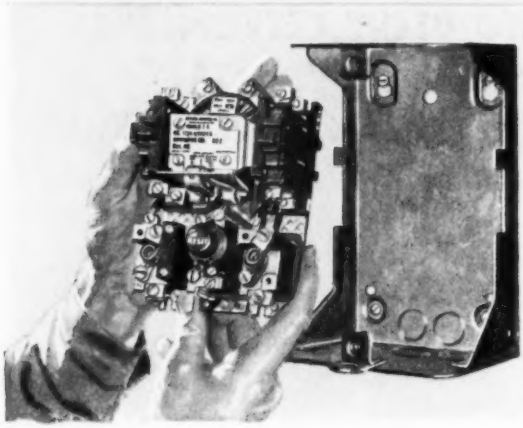
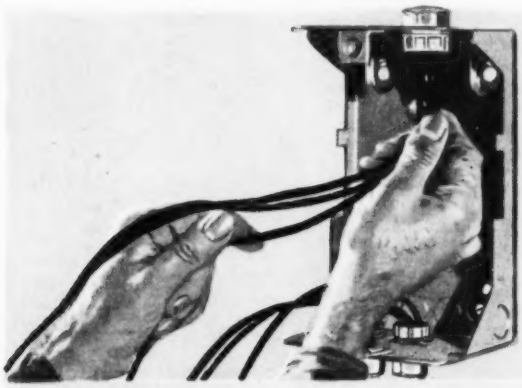
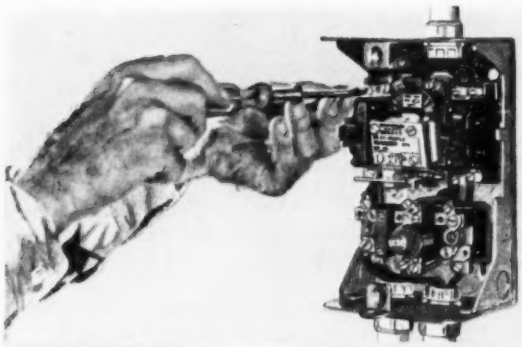


2. Remove entire starter mechanism . . . by merely loosening three screws. Then light, easy-to-handle skeleton case can be installed. Embossed mounts for good job on uneven surfaces. And upper mounting holes are keyhole slotted.





3. Pull in wires . . . Making conduit connections and pulling wires is a cinch. No starter mechanism or side walls of case in the way. No skinned knuckles or damaged starters.



4. Connect up and go . . . Straight-through wiring; all line terminals at top, load terminals at bottom. All terminals are clearly marked and visible from front. Pressure connectors throughout. All panel wiring is color coded.

Factory records everywhere today show the cost of installing motor control is almost always greater than the cost of the equipment, often two to three times as much. That is why Cutler-Hammer engineering made easier installation a key objective in designing the new Cutler-Hammer ☆ ☆ ☆ Motor Control. When you buy motor control, figure its *real* cost, its installed cost. Then you too will insist on Cutler-Hammer! Your nearby Cutler-Hammer Authorized Distributor is ready to serve your needs. Order from him today.

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SEPTEMBER, 1953

Plant Engineering

IN THIS ISSUE

Foot-Loose Machinery Raises Production 85
Revised Plant Layout Increases Efficiency 88
Electrical System Keeps Pace with Plant Changes 91
Maintenance Painting Problems in the Food Industry ... 92
Overhead Handling Designed for the Future 95
Automation Does It Again! 96
King Size Kern River Roofing Job 98
How to Use Sounds for Signals 100
High or Low Pressure Steam? 102
Here's a New Angle on Resurfacing 103
Heat Does Work in Straightening Bent Shafts 104
Industrial Tractor "Sprouts" Crane 105
Two-Way Pneumatic System Handles Flour and Sugar .. 106
Operational Analysis—Tool for Accident Prevention 108
Versatile Power Transmission Twins 112
New Storage Building Slides, Stacks, Tilts 114
Plant Engineer's Role in Employee Relations 115
Pneumatic-Hydraulic Fluid Power Systems 117
Selection, Use and Care of Tools—Scrapers 121
Visual Inspection—Part IX 122
Manlifts — Safety Features 122C

REGULAR DEPARTMENTS

'Round About with the Editors 4
Backtalk About Our Past Issues 30
Plant Engineers' Digest 34
Bulletins and Catalogs 39
Operation and Production 60
Construction Briefs 77
News from the Plants 124
New Products and Processes 134
New Books Reviewed 186
Data File of Commercial Literature 193
Advertisers' Index 222

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The magazine that helps plant engineers with their everyday problems